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ABSTRACT

This resource guide and supplement contain class activities and discussion pieces for use in integrating energy education into driver education. Included are such activities as survey-taking, fuel consumption calculations, and extensive examination of transportation alternatives such as bicycling, carpooling, mass transit, and alternative means of student transportation to school. The appendices provide supporting information and a bibliography. Supplements accompanying the resource guide include a collection of transparency masters, and a collection of fuel saving tips for drivers. (RE)

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Some things are worth saving...

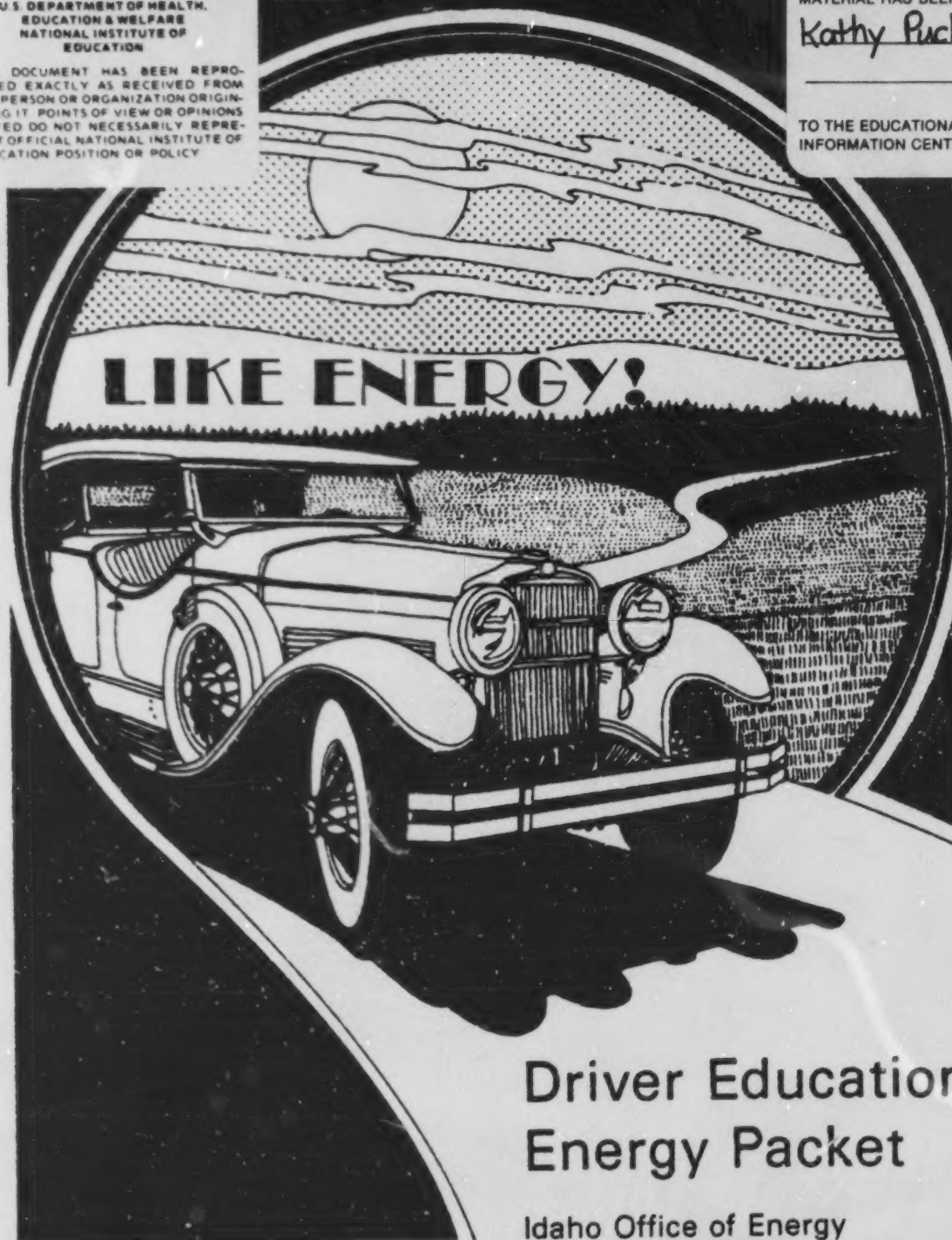
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Driver Education Energy Packet

Idaho Office of Energy

SE 029 779



STATE OF IDAHO

OFFICE OF THE GOVERNOR

BOISE

JOHN V. EVANS
GOVERNOR

November, 1977

AS AN INSTRUCTOR IN DRIVER TRAINING.....

you have the opportunity to help instill a conservation ethic in a new generation of Idaho drivers.

In these times of diminishing fuel supplies and increased costs, it is imperative that our society become more conscious of better driving habits, more efficient vehicles and alternative means of transportation.

The Idaho Office of Energy has prepared this Driver Education Energy Conservation Packet for use in your classroom. We feel that inclusion of these aids in your curriculum will do a great deal to increase awareness for the need for energy conservation as it relates to transportation.

We urge you to incorporate this information into your teaching program this year and on a continuing basis. The title of the packet--"Some things are worth saving...Like energy!", says it all. We must start now to assure a brighter energy picture for the future. Your help is greatly appreciated.

Sincerely,

Handwritten signature of John V. Evans.
John V. Evans
Governor

Handwritten signature of Roy Truby.
Roy Truby
Superintendent of Public Instruction

ENERGY CONSERVATION in TRANSPORTATION

A Driver Education Energy Packet



JOHN V. EVANS
Governor

by

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We want to thank the Idaho Department of Education, Driver's Education people, Duane Kirk and Allan Cafferty, for their support and help from the conception of this project and for delivering these materials to driver's education instructors throughout the state.

Invaluable advice was gained from Dave Kennedy and Dick Barnhard of the Washington Superintendent of Public Instruction, Carol Costello of the Washington State Energy Office and Karen Underwood of the Idaho Department of Education.

Last, but certainly not least, we want to thank those wonderful folks at the State Print Shop...for their advice, their friendliness and for the quality job that they always do.

Thank you one and all -- we never could have done it without you!

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I. Energy and Transportation: An Overview

**THAT'S NOT WHAT
"SAVE ENERGY" MEANS.**



ENERGY CONSERVATION MEANS...

MAKING MORE EFFICIENT USE OF THE ENERGY THAT WE NOW USE. It has been shown that we waste nearly half of what we now consume. Conservation does not mean "doing without"; it really means stretching our finite energy resources so that curtailment is less likely to occur.

AND

CHOOSING TO USE LESS ENERGY. Most of us can lower our "level of living", the rate at which we consume energy, without adversely affecting our "standard of living", which has to do with the personal satisfaction we receive from the way we live.

YOU AND ENERGY

Let's take a look at ourselves. As Americans we enjoy a standard of living equaled by only a few other countries of the world. Most of us have enough to eat, a warm place to sleep, exciting opportunities for a good education, a worthwhile job and recreation and friendships. There is, however, a fundamental element to making all of this possible--to making life itself possible--E N E R G Y. As average Americans, we use more direct and indirect energy individually, in a single year, than some people in Asia and Africa may use in a lifetime. Today our country is using nearly three times the amount of energy it was using twenty-five years ago. Some projections would have us consuming the equivalent of over forty-three million barrels of oil per day by the year 1980. (Understanding the National Energy Dilemma, 1973) Compare that with the nineteen and one-half million barrels of oil per day equivalents we were consuming in 1960. To make this enormous energy consumption picture even more astounding, we must realize that the laws of thermodynamics restrict us from using all the available energy and because of the current inefficiency of our energy use, more than half of that forty-three million barrels of oil per day would be lost energy that would do no work whatsoever for us.

To compound this growing dependency on ever increasing amounts of energy are the very hard and cold facts that there are limits to what is available and using more energy results in higher levels of pollution. If we recognize that a future is before us with diminishing amounts of the conventional sources of energy, we should anticipate a future considerably different than our past. This doesn't mean that our future will be any less exciting, pleasant or challenging than what we experience today--on the contrary it could actually mean that it will be a good deal more exciting.

A fundamental challenge is to first understand something that most of us have been blissfully ignorant of--what is energy and what dependencies do we have upon it. We also have some responsibilities toward understanding how we individually can conserve and use energy more efficiently and thereby extend our available supplies and permit time to develop alternative and renewable sources of energy. This individual responsibility involves an examination of our life styles--how we travel, eat, heat our homes and what we do for entertainment. It takes energy to do all of these things and there is no question we can, through conservation and applied technology, do a more energy efficient job. France, West Germany, and Sweden use up to one-third less energy than we do, yet their standard of living is the equal of ours.

We are in for a big change but that is really nothing new. Change has been a part of the human experience since we first came on the earth scene. This change toward understanding energy and using it more wisely will open up a new and exciting era of discovery. The Mme. Marie Curies and Albert Einsteins of this age will be making scientific and social discoveries

every bit as significant to their societies' futures as their predecessors..
What is perhaps more important is that we can understand and act in a
manner that will secure the sound values of our society and also reunite
us with our dependencies on our earth.

*from Energy 2000, Washington Superintendent of Public Instruction.

Your Opinion Counts

Name:

These questions examine your opinion about different aspects of the energy situation. There are no right or wrong answers; your response represents your opinion. Circle the letter of your opinion for each question. When completed have a class discussion about the questions and the responses.

1. What is your opinion about the energy shortage; do you think it is a temporary or short-range problem which will go away quickly, a problem which will exist for only a few years, or do you think it is a long-range problem with which we will have to deal for some time to come?
 - a. a temporary problem
 - b. a problem that will exist for a few years
 - c. a long-range problem
2. Which of the following do you feel has contributed the most toward the current energy shortage?
 - a. industry
 - b. government
 - c. individuals
3. How good a job has the average citizen done in cooperating to reduce his energy consumption?
 - a. excellent
 - b. good
 - c. fair
 - d. poor
4. How good a job do you think business and industry have done in combatting the energy crisis?
 - a. excellent
 - b. good
 - c. fair
 - d. poor
5. All things considered, do you think citizens will, on their own initiative, further reduce energy consumption or do you think the government will have to force them to do so?
 - a. will do so on their own initiative
 - b. government will have to force them to do so
6. In your opinion, should any government agency take on the responsibility to regulate energy consumption?
 - a. yes
 - b. no

7. At what level should the primary responsibility for overseeing energy usage and establishing guidelines be, providing that such government actions are found necessary?
- federal
 - state
 - local
8. If regulations for energy consumption should become necessary, which of the following sectors should be regulated? (You may choose as many as you want.)
- industrial
 - commercial
 - residential
 - transportation (residential)
 - transportation (commercial)
9. In your opinion, would it be acceptable to reduce consumption of energy by letting the price of energy go up so high that demand will never exceed energy supplies?
- yes
 - no
10. How long do you think it took natural forces to produce our present petroleum reserves?
- 100 years
 - 1000 years
 - 5000 years
 - 100 million years

In this section, please check (✓) the single blank in each row that best describes your feeling. For example: If you thought that the energy crisis could be described as "slightly decreasing," you would check (✓) the scale as shown below:

	<u>Extremely</u>	<u>Slightly</u>	<u>Neither</u>	<u>Slightly</u>	<u>Extremely</u>	
Increasing	_____	_____	_____	_____✓_____	_____	Decreasing

I believe the energy crisis is:

True	_____	_____	_____	_____	_____	False
Changeable	_____	_____	_____	_____	_____	Stable
Interesting	_____	_____	_____	_____	_____	Boring
Concealed	_____	_____	_____	_____	_____	Revealed
Optimistic	_____	_____	_____	_____	_____	Pessimistic
Safe	_____	_____	_____	_____	_____	Dangerous
Dishonest	_____	_____	_____	_____	_____	Honest
Unimportant	_____	_____	_____	_____	_____	Important
Old	_____	_____	_____	_____	_____	New
Relaxed	_____	_____	_____	_____	_____	Tense

Energy Transportation Survey

Name: _____

Listed on the following pages are a number of statements relating to energy, transportation and environmental issues. Please indicate whether you agree or disagree with these statements by placing a check in the appropriate blank. When completed have a class discussion about these statements and how students reacted.

	<u>Strongly</u> <u>Disagree</u>	<u>Slightly</u> <u>Disagree</u>	<u>Neutral</u>	<u>Slightly</u> <u>Agree</u>	<u>Strongly</u> <u>Agree</u>
1. The energy crisis is a pressing national problem which demands real sacrifices on the part of all citizens.	_____	_____	_____	_____	_____
2. New automobile engines have been produced which significantly increase gasoline mileage.	_____	_____	_____	_____	_____
3. Oil companies that advertise their efforts to develop new energy sources are more concerned with public relations than resource development.	_____	_____	_____	_____	_____
4. People should include as many stores as possible in one shopping trip.	_____	_____	_____	_____	_____
5. The 55 mph speed limit on federal highways has been effective in reducing vehicle speeds.	_____	_____	_____	_____	_____
6. Although mass transit would be a good way to conserve energy, it is rarely used because it seldom meets the needs of potential users.	_____	_____	_____	_____	_____
7. One benefit associated with the energy crisis will be a reduction in air pollution due to fewer automobiles on the road.	_____	_____	_____	_____	_____

	Strongly Disagree	Slightly Disagree	Neutral	Slightly Agree	Strongly Agree
8. The energy crisis should be viewed as beneficial since it will reduce auto travel as well as the accident rate.	_____	_____	_____	_____	_____
9. Gasoline rationing would be an unnecessary hardship on our citizens.	_____	_____	_____	_____	_____
10. Rationing of energy resources (i.e., gasoline) will be necessary in the very near future.	_____	_____	_____	_____	_____
11. The reduction of air pollution is more important than energy conservation.	_____	_____	_____	_____	_____
12. It is useless for me to take energy conservation measures seriously since my contribution won't make that much difference.	_____	_____	_____	_____	_____
13. Since every man is a consumer, it is the consumer sector that is responsible for the energy crisis and not the government or the oil companies.	_____	_____	_____	_____	_____
14. Automobile engines that operate on fuels other than gasoline will be used in the future to conserve petroleum resources.	_____	_____	_____	_____	_____
15. Trucking companies are doing their fair share to reduce fuel consumption by observing the 55 mph speed limit on federal highways.	_____	_____	_____	_____	_____
16. Increased energy costs (i.e., gasoline and electricity) have reduced the amount of money that people have left after paying for necessities.	_____	_____	_____	_____	_____

	Strongly Disagree	Slightly Disagree	Neutral	Slightly Agree	Strongly Agree
17. Gasoline stations are making unreasonably high profits.	_____	_____	_____	_____	_____
18. Gas stations provide the same level of services now as they did before the energy crisis.	_____	_____	_____	_____	_____
19. Airlines should continue to reduce the number of flights available in order to conserve fuel.	_____	_____	_____	_____	_____
20. I make about the same number of shopping trips now as I did a year ago.	_____	_____	_____	_____	_____
21. Due to the recent introduction of antipollution devices on new cars, cars are no longer a serious source of air pollution.	_____	_____	_____	_____	_____
22. There should be more carpooling in order to significantly reduce gasoline consumption.	_____	_____	_____	_____	_____
23. Since the price of gasoline has risen significantly, people have cut down on their driving.	_____	_____	_____	_____	_____
24. Lower speed limits (55 mph) on federal highways have significantly reduced gasoline consumption.	_____	_____	_____	_____	_____
25. The energy shortage has made our highways less crowded.	_____	_____	_____	_____	_____
26. The worst of the energy crisis has passed.	_____	_____	_____	_____	_____
27. Technological advances will produce a solution to the energy crisis.	_____	_____	_____	_____	_____
28. In the winter months, oil companies should reduce gasoline production in order to assure an adequate supply of heating oil.	_____	_____	_____	_____	_____

Discussion Questions

1. Determine those events in the last 50 years which have led to utilizing greater amounts of energy. Was the impact of an international, national, state, or local scale? For example, building a national network of freeways; advertising that bigger cars are better; lighting streets for safety. Many more events can be cited and their implications explored.
2. How might the fuel shortage affect the average consumer's future purchasing decisions? Explain and give examples to illustrate.
3. What are some measures we can take to minimize the economic consequences of the fuel shortage?
4. Have you or your family been able to stabilize your transportation energy expenditures or lower your transportation energy costs? If so, how?

Activities

1. Taking obvious precautions, establish a traffic-counting station at an intersection near your school. Divide the class into teams which record and count the traffic for 10 minutes at each of three different times during the day for a week. Then display the results in chart form, showing the types and numbers of vehicles which passed at each time period, for the day and for the week.
 - * At what time of the day was the traffic heaviest and when was the traffic lightest? Why?
 - * Which day of the week had the heaviest traffic and which had the lightest?
 - * What was the total number of vehicles that passed during the 1-week tally?
 - * Is the traffic bothersome in any way at any time? In what way?
 - * Should there be fewer cars? Why?

Additional Activities:

1. Students might count the passengers in each vehicle and graph the results.
2. Try to guess what types and numbers of vehicles would be represented by the next 20 cars, using the results compiled from the first 100 vehicles. The actual result should be checked against the guess or prediction made earlier. Repeat several times.
 - How many categories did you tally? What were they?
 - Which vehicles were in the greatest number and which were in the least number?
 - How many of each kind of vehicle did you observe?
 - How many automobiles had only one person in them?
 - Did many of the vehicles seem to release excessive amounts of exhaust smoke and fumes?
2. Have students interview parents or grandparents or older members of your community concerning changes in transportation that they recall. This will give students insight into transportation use patterns 20, 30 and 50 years ago. Determine:
 - a. The size of the community (then and today)
 - b. The energy-requiring devices used (then and today)
 - c. Differences in lifestyle (then and today)
 - d. Differences in energy cost (then and today)
 - e. Mode(s) of transportation -- energy requirements, products, waste products (then and today)
 - f. Extent of concern for pollution and environmental degradation (then and today)
3. Write or act out an imaginary interview with a historical figure about energy uses in transportation in his/her time. Compare them with energy uses in transportation today.



II. Transportation and You

DID YOU KNOW...

WE PRODUCE TWO
CARS FOR EVERY
BABY BORN.

AND, THERE ARE
8,700 BABIES BORN
EVERY DAY WHO
DEMAND ENERGY.



ENERGY AND THE AUTOMOBILE

Cars are, without a doubt, a wasteful form of transportation.

- * Almost 37% of the energy they take in is shot right out of the exhaust pipe. Per gallon of gasoline, cars are only one-sixth as efficient as city buses and one-seventh as efficient as commuter trains in moving people within cities. Outside of the cities, they are often the only means of moving around at all.
- * Statistics show that more than half of all auto trips are for less than five miles, and three-quarters are for less than ten miles. Usually these trips are trips to work or to the store, and the driver is generally alone in the car.
- * The size of American cars increases their inefficiency. A car weighing 5000 pounds uses over twice as much fuel as a car weighing 2000 pounds. Other extras such as air conditioning, high horsepower, and power equipment decrease the mileage per gallon even more.
- * Super-highways make the problem even worse, for the faster a car goes, the more fuel it uses. The average car driven between 75 and 80 mph will consume almost twice as much fuel per mile as the same car driven at 50 mph.

There are more than 100 million registered automobiles in the United States. A typical car, with an average fuel economy of less than 15 miles per gallon, travels about 10,000 miles each year and uses well over 650 gallons of gasoline. Passenger automobiles consume about 14% of all the energy and about 31% of all the petroleum used in the United States. Here in Idaho, our automobiles consume about 22% of our total energy budget. Within the transportation sector, our automobiles use about 70% of the energy consumed.

Given the fact that our remaining economically-recoverable petroleum reserves are fast dwindling and that we in the United States are now dependent on unstable foreign sources for half of our petroleum needs, we must all take immediate steps to conserve. One reason, of course, is that if we run out our mobility we will be greatly decreased in the short run. Another very important one, however, is that there are many non-fuel uses for petroleum such as medicines, oils, paints, clothing and others.

The importance of individual gasoline savings cannot be over-emphasized. If fuel used by the average car could be reduced just 15% through better planning, better driving practices, better maintenance, and increased use of alternative transportation, these fuel savings would represent a National reduction of nearly 28 million gallons of petroleum per day or 4% of current demand. This potential saving in daily fuel consumption is significant from several points of view. It would help stretch American's current fuel supplies further. It would save money, cut pollution, and, it would bring us considerably closer to our goal of energy self-sufficiency.

Automotive Energy Conservation

Conservation practices can be employed by every automotive driver in these five areas (drivers of small pickup trucks can also save fuel and money by following these tips.): *

- I. Improved Driving Skills
- II. Improved Trip Planning
- III. Maintenance and Car Care
- IV. Awareness of Gasoline Usage
- V. Selecting New Car Wisely

- I. IMPROVE YOUR DRIVING SKILLS--The most important single element in determining fuel economy of a particular car is the driving technique of the individual behind the wheel. One authority declares that a careful driver should be able to get at least 30% better mileage than an average driver, and 50% better mileage than a poor one. Here's our advice:
1. Start slowly by accelerating gently except when entering high speed traffic lanes or when passing. Hot rod driving and jerky acceleration can increase fuel consumption by 2 miles per gallon in city traffic.
 2. Avoid unnecessary braking and try to anticipate the traffic ahead. When the traffic light far ahead turns red, take your foot off the accelerator immediately. The light may turn green again by the time you reach the intersection. If not, there's still a fuel saving. In coasting, the car's kinetic energy maintains propulsion rather than the burning of additional fuel. There is then less energy to be dissipated in braking. Don't tailgate. This necessitates additional braking, too.
 3. Drive at moderate speeds. As your speed increases, so does your car's wind resistance -- a big factor in gasoline mileage. Most automobiles get about 28% more miles per gallon on the highway at 50 miles per hour than at 70 and about 20% more at 55 than at 70.
 4. Drive at steady speeds. Hold a steady foot on the accelerator as long as traffic conditions permit. On the highway, "see-sawing" or repeatedly varying the speed by 5 miles per hour can reduce gas mileage by as much as 1.3 miles per gallon.

*Our thanks to the Federal Energy Administration, "Don't Be Fuelish".

5. Observe the 55-mph speed limit. Most automobiles get about 20% more miles per gallon on the highway at 55 mph than they do at 70 mph. Actually the best fuel economy will be realized at about 40 mph.
6. Save gas when changing gears. If you drive a car with a manual transmission, run through the lower gears gently and quickly for minimum gasoline consumption, then build up speed in higher gear. If you drive a car with an automatic transmission, apply enough gas pedal pressure to get the car rolling, then let up slightly on the pedal to ease the automatic transmission into high range as quickly as possible. More gas is consumed in the lower gears.
7. Avoid unnecessary use of air conditioning equipment. When in use, it reduces fuel economy by as much as $2\frac{1}{2}$ miles per gallon.
8. Avoid excessive idling. The average American car consumes a cup of gasoline every 6 minutes when idling. When you stop the car, don't idle the engine for more than a minute. If you are waiting for someone, turn off the engine. It takes a lot less gas to restart the car than it does to idle it.
9. Break gas-wasting habits. For instance, don't pump the accelerator or race the engine when your car isn't in motion. It wastes gasoline. And use the brake pedal rather than the accelerator to hold your car in place on a hill.

II. IMPROVE YOUR TRIP PLANNING

1. Join a carpool for commuting to and from work.
2. Plan short trips carefully. Short trips are costly in terms of gas mileage. A vehicle started cold and driven four miles may average about 8 miles per gallon. The same vehicle warmed up and driven 15 miles may average nearly 13 miles per gallon. However, don't idle the engine to warm it (a wasteful practice.) Drive slowly the first few blocks.
3. Consolidate your driving. Combine short shopping and commuting trips to reduce the miles traveled for each action. Patronize shops in your immediate area as much as possible to reduce mileage.
4. Pre-plan your trips. Figure out which route will require the least fuel. Allow for the fact that freeway driving is nearly twice as economical as driving in heavy city traffic. Travel during off-peak traffic times whenever possible. Use routes with a minimum number of traffic lights and stop signs.

5. Think economically. If you have more than one car in your family, make the greatest use of vehicle(s) consuming the least amount of gasoline.
6. Eliminate unnecessary trips. If every automobile took just one less 10-mile trip a week, the Nation would save 3½ billion gallons of gas a year, or nearly 5% of the total passenger car demand for gas.

III. MAINTENANCE AND CAR CARE

1. Get a tune-up. Keep your car engine tuned according to the specifications given in your owner's manual. If your manual is lost, then follow this plan: Every 10,000 miles a major tune-up should be done. That means:
 - * Install new spark plugs, ignition points, and condenser.
 - * Clean or replace the positive crankcase ventilating (PCV) valve, and remove gum or sludge from the hoses.
 - * Check all electrical ignition circuits and connections for voltage drop and resistance. Clean, tighten, and replace them as necessary.
 - * Inspect the choke for proper operation.
 - * Set the timing to the manufacturer's specifications.
 - * Check the ignition advance mechanism (mechanical and vacuum).
 - * Remove foreign matter from the exhaust gas recirculatory valve and hoses and check the controls following the manufacturer's specifications.
 - * Check the exhaust system for blockage.
 - * Replace air and fuel filter elements.
 - * Check for fuel leaks at carburetor, fuel pump, gas line and gas tank.

About 5,000 miles after the major tune-up, a minor tune-up should be performed. This may involve cleaning the plugs, and adjusting points and timing as necessary.
2. Keep the engine air filter clean. An air-starved engine wastes gasoline.

3. Check tire pressures regularly, at least once a month. Under-inflated tires increase gas use. You can lose about 2 percent in fuel economy for every pound of pressure under the recommended pounds per square inch. For best gas mileage and for driving on long trips with heavy loads, inflate your tires 3 to 4 pounds above the recommended pressure but do not exceed 32 psi. Under-inflated tires can decrease fuel economy by as much as 1 mile per gallon.
4. Consider buying radial tires. Radial tires will give you from 0.5 to 1 more miles per gallon. Their initial high cost is usually paid for in fuel savings and longer tread life. Warning: Do not mix radial tires with conventional tires.
5. Make sure your wheels are properly aligned. An annual check is in order. Improper front wheel toe-in alignment can increase fuel use by 0.3 miles per gallon.
6. See that your brakes are adjusted correctly. Dragging brakes can rob gasoline economy. Be sure they are releasing properly.
7. Don't carry unnecessary weight. The lighter the car, the less gas it uses. For every additional 100 pounds, gas consumption can increase as much as 0.2 miles per gallon.
8. Change oil and oil filter at recommended intervals. Dirty oil can seriously damage engine parts and cause friction and wear that rob gas mileage. A worn engine that burns oil will require more frequent tuning and get progressively poorer gas mileage.
9. Use a good quality multi-grade (multi-viscosity) oil having an API SAE rating on the container. Multi-grade 10W-30 and 10W-40 oils help reduce internal engine friction and give better gasoline mileage than single grade SAE30 oils. Do not use an oil of higher viscosity than recommended in your owner's manual since heavier oils tend to increase friction and decrease miles-per-gallon efficiency. A lower viscosity oil such as 5W-30 is recommended for winter months in the northern states.

IV. BECOME AWARE OF GAS USAGE

1. Keep a check on miles per gallon. That's the number of miles you get from one gallon of gas. Record the amount of gasoline added to your tank at each fill-up and the odometer reading. Miles per gallon is obtained by dividing the miles traveled since the previous fill-up by the gallons added at the last fill-up. This is all that is needed to see if these energy saving ideas are helping. You can also quickly detect the need for another tune-up when your mileage drops.

2. Consider installing a miles-per-gallon meter or a manifold vacuum gauge. The gauge can teach you good driving habits by visually indicating the vacuum in the intake manifold which is directly related to gas efficiency. To increase your gas mileage, learn to drive so that you achieve a high vacuum reading on the gauge
3. Buy gas only when the gauge shows a quarter tank or less. The practice of keeping tanks nearly full at all times is wasteful. Each fill-up introduces the possibility of spillage. The higher gas tank weight also adversely affects mileage.
4. Use gasoline of the proper octane rating. Using too low an octane rating for your car will produce a "ping" which, if sustained, will damage the engine. Using too high an octane rating wastes money and will not produce more power or improve fuel economy.
5. Don't let the gas station attendant overfill your tank. Tell him to stop at the cut-off on the automatic valve. This will eliminate any chance of spillage.

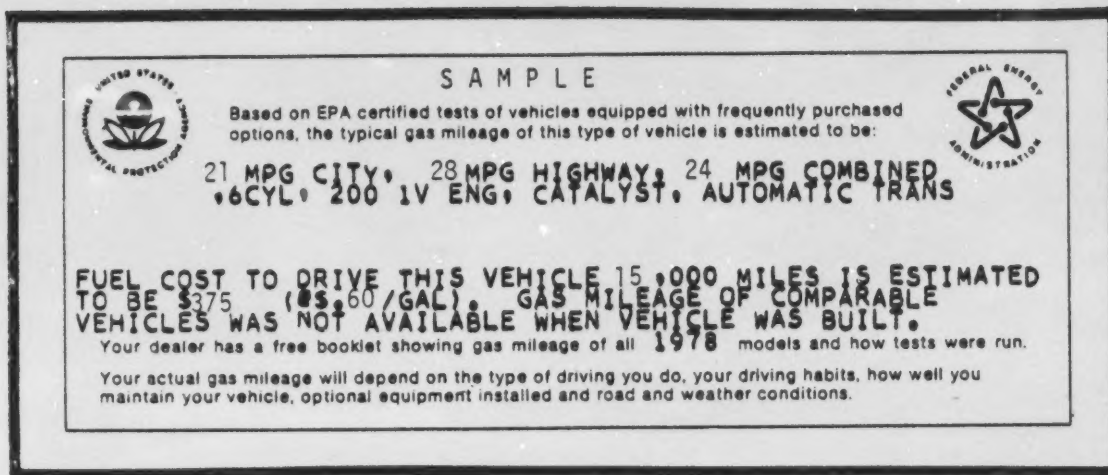
V. NEW CAR SELECTION

1. Buy your new car on the basis of the combination of purchase price and estimated fuel costs for as long as you plan to keep it.
2. The most significant variable affecting fuel consumption in an automobile is its weight - a car weighing 5000 lbs. (2268 kg) uses more than twice as much fuel as one weighing 2000 lbs. (907 kg.)
3. Four-cylinder engines usually consume less gasoline than six-cylinder engines. Similarly, six-cylinder engines use less than eight-cylinder engines.
4. An air conditioner typically increases average fuel consumption by 9% and by as much as 20% when operated in stop-and-go traffic on a hot day.
5. Convenience accessories such as an automatic transmission and power steering add to gasoline consumption. Power steering can cost nearly 1 mpg (0.4 km/l) in fuel economy. A manual transmission saves only about 0.2 mpg (0.8 km/l) in a full size model but can save 1.2 mpg (0.5 km/l) in a small car. Other equipment such as power brakes, electric motor-driven windows, power driven seats, and power driven radio antennas require little energy to operate. However, these items as well as vinyl roofs and most other accessories add to the vehicle weight and thus reduce fuel economy.

6. Cars having diesel engines achieve 40-50% improvement in the fuel economy over cars powered by conventional engines. In their current state of development, however, rotary engine vehicles tend to be less efficient (by as much as 20-35%) than cars of similar weight powered by conventional engines.
7. Overdrive options and cruise control can save up to 15% on fuel at highway speeds. These are good choices on a new car.
8. A light exterior car color combined with light interior upholstery will reduce heat absorption and keep your air conditioner from working so hard.
9. Tinted glass helps reduce the need for air conditioners.
10. Fuel injection usually saves gasoline by more uniformly and efficiently distributing the fuel than do carburetors.
11. An electronic ignition system also is a fuel saver. Its improved spark means better combustion and less chance for fuel-robbing spark plug fouling.
12. Radial ply tires allow up to 6% better gas mileage because they produce less rolling friction.

For more information write to: Fuel Economy, Public Documents Distribution Center, Pueblo, Colorado 81009, and ask for the latest "Gas Mileage Guide for New Car Buyers". Study the fuel economy figures associated with low vehicle weight, small engines, manual transmission, low axle ratio, and low frontal area (the width of the car times its height).

Fuel Economy Labels



All 1977 passenger automobiles and light trucks are required to have gas mileage labels if they have gross vehicle weights of 6000 pounds or less. There are two types of labels. The one that will appear on most vehicles is the GENERAL Label. The fuel economy numbers on these labels are the same as those that appear in "Gas Mileage Guide" and are based on an average of fuel economy test results for similar versions of a given model.

The SPECIFIC Label (which will be clearly marked "Specific Label") will have additional information about that vehicle's characteristics and will have fuel economy estimates that relate to a specific individual vehicle within the model line. Because of this, the Specific Label in some cases will have fuel economy estimates that are different from the General Label values in the "Gas Mileage Guide."

Also, the estimates on a Specific Label may not fall into the range of fuel economy estimates listed for its class. This is because a specific model may be more fuel efficient than the average for the model type.

THREE FUEL ECONOMY ESTIMATES

CITY fuel economy reflects trips for local errands, driving to work, and general stop-and-go driving in urban and suburban areas.

HIGHWAY fuel economy reflects long-distance driving on non-urban roads and on interstate highways at a speed averaging about 50 MPH with no stops.

COMBINED fuel economy is a weighted average of the city and highway estimates based on Federal Highway Administration studies of average U.S. driving patterns. THIS VALUE (which assumes approximately half city and half highway driving) is what the average driver can expect in overall summer driving on level roads after the car has been broken in.

Taken from Gas Mileage Guide for New Car Buyers, FEA/EPA, 1977.

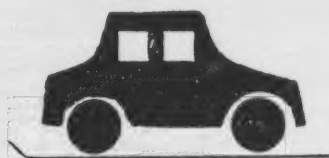
The city and highway fuel economy values in this Guide come from tests conducted or approved by the U.S. Environmental Protection Agency (EPA). These tests are performed on vehicles submitted by the auto industry to EPA to demonstrate compliance with the requirements of the Clean Air Act and the Energy Policy and Conservation Act. Each vehicle is tested under precisely controlled conditions by professional drivers in a laboratory on a dynamometer. The dynamometer is a machine that permits exact simulation of the vehicle's operation under various driving conditions. Temperature is controlled in the laboratory in a range of 68° to 86°F. in order to provide the same temperature conditions for all vehicles.

CITY TEST

This test simulates a 7.5-mile, stop-and-go trip with a speed range of 0 to 56 MPH, and an average speed of 20 MPH. The trip takes 23 minutes and has 18 stops. Eighteen percent of the trip is spent idling, such as would be expected in the city at traffic lights or in rush-hour traffic. Two kinds of engine starts are used. One is a cold start, which is similar to starting a car in the morning after it has been parked all night. The other is a hot start, which is similar to starting a vehicle after having parked it for a short time while shopping. The information from this test is then combined to represent the fuel economy of that vehicle during a realistic mixture of hot and cold starts during urban driving conditions.

HIGHWAY TEST

This test simulates a 10-mile, NON-STOP trip that begins with the vehicle warmed up. The trip has an average speed of about 50 MPH and lasts 13 minutes. The speed during the test ranges from 0 to 60 MPH. IF YOUR HIGHWAY DRIVING SPEED AVERAGES FASTER THAN THE TEST'S AVERAGE OF 50 MPH, YOU SHOULD EXPECT TO ACHIEVE POORER FUEL ECONOMY than the highway fuel economy estimate in this Guide. The amount of this decrease is approximately 10 to 15 percent for every 10 MPH above 50 MPH.



"... the EPA mileage figures are estimates, your actual fuel economy will vary depending upon the type of driving you do, your driving habits, how well you maintain your vehicle, optional equipment installed, and road and weather conditions ..."

ENERGY ON THE FARM

Here are some suggestions to save transportation fuel and money in farming operations:

1. Tractors with faulty governors can lose as much as 80% of their normal power output. Neglected maintenance can knock 25% off a tractor's rated power.

Remember:

- check the manual for tips on maintenance
 - operate the tractor near capacity
 - use smaller tractors for light loads
 - gear up and throttle back on partial loads
 - couple equipment to reduce trips over a field
 - shut the tractor off rather than let it idle unnecessarily
 - double check machinery adjustments
 - keep all engines tuned up
 - clean or replace air filters
 - reduce tire slippage by adding wheel weights
 - move large equipment by truck instead of driving it several miles
 - keep blades sharp
 - use the right equipment for the job
 - set controls properly
 - keep electrical equipment clean
 - use preventive maintenance
 - changing badly fouled spark plugs can perk up engine performance by 10% and decrease fuel use by 6%
 - Kansas researchers found 46% of tractors studied had improperly adjusted carburetors and proper adjustment lowered fuel use 9½%!
 - an idling 80 hp gasoline tractor or an idling 145 hp diesel engine wastes a half gallon (1.9 liters) of fuel an hour.
2. When chopping haylage, a forage harvester set at 1/2 (1.3 cm) length-of-cut instead of 1/4 inch (0.6 cm) uses about 1/2 less power.
 3. Tune up engines to save fuel - increase power.
 4. Reduce tillage to save up to two gallons of fuel per acre.
 5. Correct implements to cut out trips and save fuel.
 6. Shift up - throttle down - save more fuel.
 7. Shut off engines - idling wastes fuel.
 8. Use wheel weights for heavy jobs - remove for light work.
 9. Keep proper air pressure in tires for maximum efficiency.
 10. Check with any U.S. Dept. of Agriculture County Office for more information on energy management.

Discussion Questions

1. Discuss all the ways energy is consumed in transportation on a modern farm and compare them with the ways energy was consumed before 1900, 1930.
2. In what ways is energy used in transporting farm products from the field to the consumer?

ENERGY AND TRUCKS

Members of 106 motor carrier, truck, bus, and engine manufacturing, and trade and labor organizations have joined forces with the Federal Government to create the Voluntary Truck and Bus Fuel Economy Program. This program was jointly initiated by the commercial vehicle industry and the Government to coordinate efforts to conserve our nation's precious fossil fuel resources and to save valuable dollars for the industry.

The program provides a means for all segments of the commercial motor carrier industry to share information about fuel conservation measures that are practical, workable, and economical. Through the Society of Automotive Engineers, it is helping to develop consensus fuel economy measurement procedures for trucks and buses. And it enables the Department of Transportation (DOT), the Federal Energy Administration (FEA), and the Environmental Protection Agency (EPA) to act as catalysts to free market forces in encouraging operators of trucks and buses to conserve fuel.

Fuel Tips for Trucks:

Back off 200 rpms. Stay 200 rpms under your governor maximum and you'll save fuel.

Watch your speed. Lower speeds save fuel due to less air resistance.

Keep your engine tuned. An efficient powerplant burns less fuel.

Carry maximum permitted payloads. Generally, as weight goes up, fuel per ton-mile goes down.

Check your tires frequently. Tires that are mismatched, out-of-balance, or underinflated waste fuel.

Keep "the pedal off the metal." To conserve fuel, keep a light foot on the accelerator and brake pedals. Don't hotrod or slide to a stop.

Shut your engine off. Idling for long periods of time wastes fuel.

Spec your new truck so that the engine operates at its most efficient rpm range at normal road speeds. Consider limiting rpms to 1900-1950.

Fuel Conservation Publications:

The Voluntary Truck and Bus Fuel Economy Program has prepared six publications which are now being distributed by the Federal Energy Administration. These publications are designed to encourage fuel conservation practices by commercial vehicle operators. They cover a wide range of topics including fuel-efficient equipment specifications and maintenance and operating procedures. The publications are:

FACT SHEET--VOLUNTARY FUEL

ECONOMY PROGRAM FOR TRUCKS AND BUSES--A five-page brochure describing the program, its objectives, and participating industry segments.

TRUCKIN' 'N' ENERGY--A leaflet aimed at informing truck drivers of fuel-efficient operating procedures.

TIPS FOR TRUCKERS--SAVE FUEL BY SLOWING DOWN--A sheet describing the effect of high speed and power on fuel consumption and list some fuel efficient hardware now available.

TIPS FOR TRUCKERS--RADIAL TIRES FOR YOUR FLEET?--A page summarizing the effects of the use of radial tires on fuel economy.

TIPS FOR TRUCKERS--IDLENESS IS WASTEFUL!--A two-sided sheet pointing out the amount of fuel and money you can waste through unnecessary idling.

TRUCKER'S GUIDE TO FUEL SAVINGS--A booklet describing different ways of conserving fuel and citing results achieved by various engine and tractor combinations for long-haul trucks.

To obtain any of these publications write to:

Voluntary Truck and Bus Fuel Economy Program
Office of Energy Conservation and Environment
Federal Energy Administration
Washington, D.C. 20461

Discussion Questions

1. In a letter in an issue of Newsweek, reader Vincent Benedict of Wayne, Pennsylvania, had this to say: "Since Americans weren't buying \$4,000 cars that get 13 miles for each 37-cent gallon of gas, Detroit's automotive wizards came up with a logical solution: \$5,500 cars that get 18 miles for each 57-cent gallon of gas. Brilliant." Obviously, Mr. Benedict was being satirical. Can it make sense to make cars more efficient (with a higher purchase price)?
2. In an obvious slap at the automotive industry, a public official said he found it incredible that a nation which placed a man on the moon could not design a vehicle capable of moving 20 miles on a gallon of gasoline or some other energy. What is your opinion of this statement? Do the NASA successes mean that we will automatically have more efficient cars?
3. How have people been motivated to use more transportation energy in the past? Discuss the possibility of reversing the trend from promotion to reduction of energy consumption in transportation.
4. In a letter to the Knoxville News-Sentinel, Mr. W. E. Baird commented that the public ought to be cut off from access to the energy "cookie jar." He said, "The only way to get people to conserve gasoline is to stop producing it for consumers. If anyone disagrees, they will have to prove it to me." Do you agree or disagree with Mr. Baird? Why?
5. One gallon of gasoline has the heat energy force (Btus) of 50 pounds of dynamite! Discuss with your students why they should not carry spare cans of gasoline in their cars. Why is siphoning by mouth also particularly dangerous?
6. Having cars cared for regularly is an important step in fuel conservation. Discuss with your students the necessity of: clean spark plugs, replacing oil and air filters, a properly adjusted carburetor, wheel balance and alignment, and proper tire maintenance.
7. How does the octane level of gasoline affect a car's performance and gas mileage?

Autosaur

Directions: Read the following review of a scientific spoof and answer the questions which follow:

An Arizona newswriter has projected our gasoline shortage 1,100 years into the future. He reports that a memo in A.D. 3100 states that during the twentieth century the earth was inhabited by huge metallic-looking beasts called "autosaur." These monsters weighed between 1,000 and 4,000 pounds, and could travel at terrific rates of speed. Although they could be ridden, he relates, they were never completely domesticated by the natives. Apparently thousands of natives lost their lives to them each year.

Around the last few decades of the century, he tells us, the "autosaur" mysteriously disappeared. Scientists entertain the possibility of their having starved to death because of some inexplicable depletion of their food supply. A picture unearthed near Los Angeles supporting this theory shows great lines of these creatures queued up before a feeding station. One of the natives, in an obvious attempt to forestall extinction, is force feeding the leader by means of a hose injected into its "surprisingly small orifice." This effort was evidently unsuccessful.

Our writer continues, "While the extinction of any species is to be mourned, it does not appear that the ecological balance of that period was upset by the autosaur's disappearance. There is even some proof that it was improved."

- * Why does the name "autosaur" sound scientifically valid?
- * What characteristics does the writer attribute to the "autosaur" that reveals its identity?
- * Which of the author's remarkably logical sounding statements indicates that man is not always the master of his inventions?
- * Humor can be instructive as well as entertaining. Do you find an underlying truth in this playful piece of prose? What is it?
- * Do you think the humor is enhanced by the fact that the story sounds possible and believable?
- * Which of the following conclusions do you think the author intended the reader to arrive at? What conclusion did you arrive at?
 - We should more carefully protect our endangered species.
 - Automobiles kill a great many people.
 - The gasoline shortage, in the long run, will be beneficial to mankind and his environment.
- * Does there seem to be any advantage in occasionally using a light, humorous touch, such as the author employed here, when you want to make a point? Why?

Activities

1. Suppose that, in order to conserve gasoline, a decision is made to reduce the number of automobiles in this country. Draft a set of policies, priorities, and regulations which will bring about this hypothetical circumstance as fairly as possible for all citizens. Would it be better to concentrate on increased mileage of each car or to reduce the total number?
2. Compile information about the relationship between automobile tune-ups and improved mileage. Make it available to the student body via the school paper, bulletin boards, and posters.
3. Write an article on driving habits that conserve fuel and increase mileage (e.g., slow acceleration). Include a chart showing average miles per gallon versus driving speed. Submit the article to school and local papers.
4. Five students may research and prepare presentations for the roles described below:

A large distributor of oil (one student) in a metropolitan area wishes to transport oil to his distribution plant with maximum efficiency and minimum effects on the environment. His plant is in an area with easy access to railroads, trucks, barges, and pipelines. Representatives from each of these transportation facilities (four students) present a "sales pitch" to the distributor, trying to convince him to use their facilities. After all four "pitches" have been made, the distributor will choose one of the four transportation modes and give the reasons for his decision.

5. Individually or as a group, compose a "position paper" on the automobile, with attention given to the following key questions:
 - a. Does the automobile earn its keep in terms of its contributions and in light of its disadvantages?
 - b. How do we arrive at the conclusion that the car is virtually a necessity?
 - c. Is a significant proportion of the automobile-using public aware of the total costs of automobile transportation (e.g., including air pollution, deaths and injuries; urban decay)? Are you? Explain.
6. There are over 100 million motor vehicles in the U.S. Most of these are for personal use. Write a law which restricts the use of personal autos to reduce air pollution and space pollution. What kinds of arguments would you anticipate encountering from opponents of your law? How do other countries get along with fewer and smaller cars?

7. Write some editorials and/or short stories on the energy and transportation situation. Submit these to the school paper and/or to local papers. Possible topics and subjects are:
 - a. Why I prefer small cars
 - b. The effect of the energy crisis upon attitudes and actions of car buyers
 - c. The cynicism about some people toward the reality of a gas shortage
 - d. Why the Arab oil embargo was a great gift to the American people
 - e. Car pools--a great way to meet people and make friends
 - f. Advantages of the 55 mph speed limit
 - g. What the higher energy price means to the poor nations
 - h. Why I prefer to ride my bike to school
 - i. Saving energy by using the school bus, and suggestions for improving it
8. Write a paper detailing any changes in lifestyle as a result of the gas shortage in the winter of 1973-74.
9. Write a poem that could serve as an obituary for the low gas mileage automobile.
10. Report on the gas rationing program during World War II. How did it work? What were the major problems? What were the costs of administering the program? How does the situation differ today?

Gas Station Survey

Date:

Name:

Directions:

¹Conduct a survey of gas station operations in your community. Divide the class into three groups, each of which will cover one of three stations selected for observation. The groups should record the grades of gasoline sold and the price per gallon of each at their respective locations. Graph the results back in the classroom. ²Next, record for one hour the number of customers, the amount of gas purchased, and each total sale. At the end of the hour please produce figures for total gallons sold and the total cash receipts for the gas station.

- * What will 10 gallons of each of the grades available cost at the three stations?
- * How many cars purchased gasoline in one hour at each station?
- * How many gallons of gasoline were sold at each station?
- * What was the total amount of money taken in at each station in one hour?
- * How many customers kept their engines running for more than 1 or 2 minutes as they waited in line? What do you have to say about that?
- * Do we waste gasoline in this country? Explain.

Survey Group Members:

Gas Station Name and Location:

Grades of Gasoline:

Price Per Gallon:

Number of Customers:

Gas Purchased:

Total Sale:

Total in one hour:

Total in one hour:

Total in one hour:

Gasoline Conservation Through Driving Habits

Directions:

1. Use a class survey together the following data (use larger samplings if possible).
 - a. Average automobile miles driven in one week.
 - b. Average miles per gallon of family cars.
 - c. Percentage of drivers that use "jack rabbit" starts at traffic signals. (Assign teams to observe and tally at several typical traffic light intersections.)
2. Automotive Information (September 1973) states that fast starts can increase gas consumption as much as 18 percent. Using data gathered, compute the amount of gallons of gasoline consumed by the families represented by the class. (Assume that the percentage found in item 1.c. is typical and applies to this group.)
3. Possible Extensions of this Activity:
 - a. Find a per family average: compute the savings for the community.
 - b. Find the community's annual savings.
 - c. Research the accuracy of your averages.
 - d. Develop graphs, posters, etc., to dramatize your findings. Display them in windows of local businesses willing to participate.
 - e. Similar projects could be done with other known fuel topics; i.e., vehicle operating condition, most efficient driving speeds, vehicle weight as it relates to miles per gallon. (See Driving Hints in Section IV of this book.)
 - f. Discussion problem:

A delivery man gets \$5 per hour in wages. His truck gets 18 miles per gallon if he drives 50 mph but only 11 miles per gallon if he drives 60 mph. On a 500 mile trip, at which speed should he drive in order to make his trip as economical as possible?

A Nation On Wheels

Date:

Name: _____

Mobility has always been a prominent characteristic of the American way of life. Using your own telephone directory yellow pages, identify each auto-related classification and record the classification on your data sheet. Then count the number of entries under each classification and record the number. Finally, in the space provided, decide whether the entry would exist in an autoless society.

DATA SHEET

Directory Used: _____ Date: _____

[illegible]



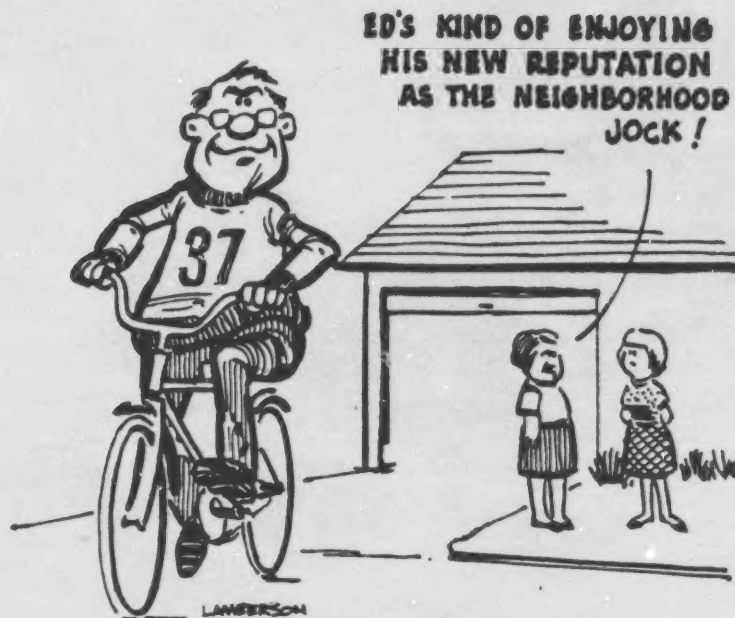
III. Other Ways to Get Around

DID YOU KNOW...

**MORE THAN HALF
OF ALL CAR TRIPS ARE
LESS THAN FIVE MILES
LONG.**

**ENCOURAGE YOUR
CITY TO INVEST IN
MORE BIKE PATHS.**

**BICYCLING IS
HEALTHY AND CHEAP.**



TRANSPORTATION TRENDS

Given the fact that gasoline prices are rising steadily and may reach the \$1/gallon mark, American drivers seem to have two choices. One is to drive less; the other is to pay more.

These are, however, not necessarily the only choices. There are alternatives. Other fuels and engines can be developed for this era when cheap, readily available gasoline is no longer a reality. A few of these follow:

New engines presently available: The conventional internal combustion gasoline engine must feel like the proverbial mousetrap: researchers are always trying to replace it with a better one. Each proposed alternative engine concept has its own advantages and its own particular disadvantages. Depending on the type of alternative engine, fuel economy can be "good" or "bad", compared to the conventional engine.

Three such engines are available in today's production automobiles: the rotary (Wankel), the CVCC stratified charge, and the diesel. The fuel economy of these engines is compared with conventionally-powered cars' economy in Figure 37, which shows that the rotary's fuel economy is worse, the CVCC's is about the same, and the diesel's is better.

For these engines, the comparison at equivalent power-to-weight ratios is valid for either city or highway MPG's.

Other alternative engines being developed are: advanced versions of the stratified charge engine, and "continuous combustion" engines including the Rankine (vapor cycle) engine, gas turbines, Stirling engines, and others. Early experimental versions of these have frequently shown inferior fuel economy test results, but their proponents believe that further development will significantly improve these engines' fuel economy capabilities.

It is too early to reach firm conclusions about the feasibility of mass production of cars powered by these advanced alternative engines; the only certainty is that such engines will not see widespread use before the 1980's.

Methanol (wood alcohol): This synthetic fuel made from renewable plant materials can be burned undiluted or mixed with gas (up to 10 percent methanol can be added without engine adjustment).

Methanol has an octane rating of 106 so it is easier on the engine than gasoline.

Most of the methanol now produced comes from natural gas but in the future waste materials like wood, coal and other carbon-containing waste materials, will be utilized.

ALTERNATIVE TRANSPORTATION

Before you drive anywhere in your automobile or other type of motorized vehicle, remember that there are other ways to get around, especially in Idaho's growing urban areas.

* Share your ride.

Go shopping with a neighbor, join a carpool or a vanpool. About one-third of all private automobile mileage is for commuting to and from work. If the average occupancy (currently 1.3 people per commuter car) were increased by just 1 person, each commuter would reduce his costs, energy consumption, and driving stress. And the nationwide gasoline savings--which would reduce our reliance on more expensive imports--would be more than 700,000 barrels per day.

* Ride a bicycle.

The bicycle is a very viable form of transportation, especially in our urban areas where a wide variety of trips can be made by bike. Bikes are good for your health, they don't pollute, and are quiet. A bike uses about 40 times less energy than an urban auto, with none of that energy from fossil fuels... (an equivalent of 1100 mpg). If 1/3 of our auto-related trips in Idaho were made by bicycle, we would save more than 2 million gallons of gas each year.

* Ride the bus.

Almost all schools in Idaho have school buses--use them! Boise has a public transit system which is serving an increasing number of energy-conscious citizens, and other urban areas around Idaho are now exploring bus transportation possibilities as well. Trips to school, work and retail centers are oftentimes just as convenient by bus, and the energy savings are dramatic. For example, on a 5-mile urban trip, a bus (6 mpg) carrying 30 people uses only one-half gallon more than the average large auto (13 mpg) carrying one person the same distance. The 30 bus riders would save about 11.5 gallons of precious gasoline by leaving their cars at home for that particular trip.

* Rediscover walking.

Traveling by foot can be a very pleasant way to get around. Some of the trips we presently make by car can be easily done by foot. Sometimes, due to congestion on the roadway, it is actually faster to walk to one's destination.

There are several reasons to consider alcohol fuel. The new materials are abundant, the cost is less and air quality would be improved.

For instance, if you owned a Gremlin and decided to modify it to burn pure methanol (around \$100 modification costs) you would probably cut the carbon monoxide emissions by 90 percent, and hydrocarbon emissions by 95 percent.

Propane: By using a special kit, a standard auto carburetor can be modified to burn propane gas. Some sacrifice in power will be required but the cost is reasonable and the emissions are nil.

Energy storage flywheel: This method of gasoline conservation is now being tested by the U.S. Department of Transportation.

The test car is a 4-cylinder Pinto equipped with a large flywheel which actually "drives" the vehicle. The engine spins the energy-storing flywheel up to a certain rpm and then cuts out. The car is moved by the energy in the moving flywheel until a predetermined minimum rpm is reached, then the engine is clutched in to recharge the flywheel.

In the preliminary tests average engine efficiency was significantly improved.

ELECTRIC VEHICLES:

Although the electric car industry is still in its infancy in our country, electric cars will continue to gain popularity, especially in urban areas and for trips under 100 miles.

The typical electric car is run by an electric motor which is "fueled" by storage batteries which could be recharged from the current in your house, business, from a windmill, or lowhead hydro power plant.

Electric vehicles show great promise in reducing petroleum consumption. For instance, if the 26 million vehicles owned as second and third cars were electric some 400 million barrels of oil could be saved each year.

At present, the range of most electric vehicles is from 20-40 miles between 8 hour recharges. Within 5 years, however, this range can be easily doubled by improvements in energy storage and power train efficiencies.

In addition to gas savings, the electric car is quiet and very clean, especially if the power is generated from a hydroelectric plant or a windmill at home.

HYDROGEN VEHICLES:

The prospect of using pure molecular hydrogen (H_2) as a fuel for vehicles is more exotic and complex than other alternatives, but when considering that hydrogen is the most abundant element in the universe and can be extracted from water, the most abundant element on the earth, and that there is no cleaner fuel, we could benefit greatly from a serious program to test hydrogen-powered vehicles.

Hydrogen, like methanol, is now produced mainly from natural gas and water. To be used as a vehicle fuel, hydrogen must be either a cryogenic liquid or in solid form as a metal hydride. A gallon of H_2 weighs only .6 pounds and supplies about 2.7 times the energy of gasoline.

H_2 has great potential but also presents several problems. H_2 is very flammable, and requires about four times more space to store on an equivalent energy basis than gasoline.

Hydrogen buses and other vehicles are now being tested. For instance, H_2 converted buses are now being used in the Provo, Utah area.

Bicycles

One solution to the energy crisis is not the future creation of some incredible new technology but the expanded use of a century-old machine that is common to every neighborhood in the state -- the bicycle.

Perhaps the world's greatest technological achievement, this remarkable invention conserves energy and materials, promotes good health through exercise, poses no threat to the environment, eliminates traffic jams and provides inexpensive transportation that is incredibly efficient.

Self-propelled on a bicycle, a human being becomes the most efficient of all moving creatures and machines -- it takes 40 times less energy to operate a bicycle than to operate the average car.

A true marvel of appropriate technology, using the strength of the most powerful muscles in the human body (thigh muscles) and relying on solar energy indirectly through food, the bicycle played a central role in the evolution of the ball bearing, the pneumatic tire, tubular construction, the automobile and the airplane.

Since its initial development and immediate popularity, the bicycle has given way to the automobile as the preferred form of private transportation. But in a world with fewer resources and more people to share them, the bicycle's expanded use seems certain. As the cost of energy goes up -- and limited supplies of fossil fuels assure us that it will -- the bicycle will become a more and more attractive alternative to the automobile.

This shift will shrink traffic lines, increase the supply of available fossil fuels, prolong the use of valuable iron, steel, aluminum, copper, and zinc and produce longer, healthier human lives.

Including direct energy costs of oil and gasoline as well as indirect energy costs involved with automobile manufacturing and sales, petroleum refining and retail sales, tire manufacturing and retail sales, highway construction, parking, garaging, repairs, maintenance, parts and insurance, the ultimate energy intensiveness of the automobile is 19,000 Btu's per mile.

By comparison, the bicycle's total energy intensiveness or total energy cost is 1,340 Btu's per mile. Measured in terms of energy, which some people feel is a more accurate standard of value than money, the bicycle is about 50 times as inexpensive to manufacture, own, operate and maintain as the automobile.

If we could measure the cost of pollution attributable to the automobile's manufacture and use, this energy cost difference would be even greater. But other comparisons are just as revealing.

For example, whereas bikeways cost 3.5 cents per passenger per mile, street systems cost at least three times that amount; and the current cost of automobile parking garage construction runs around \$1,500 per car, enough money to provide parking racks for 120 bicycles and to reduce automobile traffic congestion accordingly.

Although most Idahoans probably will look to various forms of mass transit to provide transportation over long distances, there is no reason why the bicycle can't replace the car for urban travel. More than half of all the automobile trips in this country are less than five miles long, a comfortable distance on any one of today's models of strong, light bicycles.

Discussion Questions

1. Involve the class in a discussion which focuses on the use of rapid transit systems versus the use of automobiles.
2. Do you think people would voluntarily cut down on automobile usage if there was another alternative available?
3. Compare the advantages and disadvantages of mass transportation of all kinds and determine which method will save natural resources, yet be convenient.
4. Identify and explain the energy-related advantages of riding a bicycle compared with driving a car when making a short trip.
5. The astronauts used solar energy as a primary source of energy in the "skylab." The energy is provided by a conversion of the sun's solar energy to electric energy. This source has been suggested as an energy substitute for gasoline to provide power to run cars. What are some of the problems which would occur if cars used solar energy? How could these problems be solved?
6. Discuss why many people prefer to drive a car even when a trip is not particularly demanding by bicycle or by foot.
7. According to the National Safety Council, the traffic fatalities on the nation's highways in 1974 equalled 44,500, or approximately 20% below the reported fatalities in 1973. Safety Commissioner Claude Armour has reported that the death toll on Tennessee highways in 1974 was 1258 or some 186 fewer traffic deaths than in 1973. While this 13% decrease falls below the average for the nation, it nevertheless represents a significant reduction. How much influence do you feel the energy shortage had on this reduction both nationwide and statewide? You should take into account certain variables such as less driving, lower speed limits and better enforcement.
8. Have your class discuss different transportation modes: car, motorcycle, bicycle, walking, bus, train and airplane. How do they compare in safety, fuel consumption and practicality?
9. Have your students search through books, newspapers and magazines to find pictures of cars which run on fuels other than gasoline. Have them discuss each system: electric, hydrogen, water/gas mixture, etc. Do these cars have a future? Are they practical? What are the problems involved?
10. Discuss carpooling with your class. Have them prepare a carpooling campaign for the teachers and students who must drive. What are the conditions that must be met for carpools to succeed?

Activities

ALL ABOARD

1. DIRECTIONS:

Prepare written directions for traveling from one city to another by bus, train, auto, or airplane. The public transportation routes should include directions to terminals. The class should listen carefully as you read your directions. Then, ask a pupil to trace on a wall map the route he has just heard described. If he is unsuccessful, he returns to his seat and another pupil attempts to trace the route. If he is successful, he reads the directions he has prepared, and so the game continues.

When completed, the following discussion can take place:

- * Which method of travel offers the easiest set of directions?
- * Estimate the time needed for the trip; which method would be the fastest? slowest?
- * What is a new restriction which makes the time of automobile travel longer?
- * What is the reason for this restriction on auto travel?
- * What benefits have come from this restriction?
- * Which method of travel is the most expensive? why?

MASS TRANSIT & FUEL CONSERVATION

2. Discuss with students the types of public transportation or mass transit systems available to U.S. cities (bus, subway, train). It has been suggested that through greater use of these, private citizens would use less fuel.

Suppose this were put into action.

List the fuels that would be saved. What, if any, new fuels would be used?

What jobs might be lost?

What new jobs would be created for these new transportation systems?

Economically, would it be beneficial to adopt a mass transit system in place of the present auto-dominated one?

3. Ask your parents to keep track of how much gasoline they use in a week traveling to and from work. Divide into groups of four or five students and have each group form a carpool. Using your parents' cars and gasoline consumption figures, each group should figure the total cost savings and the percentage decrease in gasoline consumption as a result of their carpool. Mix the groups up and figure the savings and percentages for the new groups. What weighted average percentage saving resulted for the entire class? Were there any differences in figures for the two different groups? Why or why not?
4. Contrast the energy units required per passenger mile for each major form of transportation (automobile, bus, plane, and train) and draw a projection of these data.
5. Draw a map of a metropolitan area and show how it might look if there were no automobiles.
6. Using the chart provided below, have the entire class rate each transportation system on each of the four qualities on a scale from "1" for "best" to "5" for "poorest". For example, "airplane" might be given a "5" for "environmental impact," while "walking" might be given a "1". Add the scores across horizontally and enter these figures in the "total" column. The system with the lowest total score may be considered the best system.

Transportation System	Safety	Energy Efficiency	Speed and Convenience	Environmental Impact	Total
Motorcycle					
Walking					
Sailboat					
Train					
Bus					
Airplane					
Canal Barge					
Motor Boat					
Bicycle					
Car					

Student Transportation to School

Have a student call the school bus garage to find out the number of buses operating at the high school. Also find out the miles driven by the buses per day and the average number of miles per gallon. Calculate the number of gallons of gas consumed by the buses per year.

Have several students count the number of student cars in the parking lot. Calculate the average number of miles driven by students to and from school.

1. Calculate the gallons of gas per student (annually) if all the students rode buses.
2. Calculate the gallons of gas per student (annually) including both gas consumed by buses and by student drivers.

Students should then break up into small groups to determine the most efficient mode of transportation. They should discuss reasons why the most efficient method is or is not used.

1. What is the impact of social standing in your school on the consumption of fuel? What are the implications on the environment and natural resources? Is this the most efficient use of fuel supplies?
2. What suggestions do you have for more efficient use of oil and gas?
3. In the event of another fuel shortage, what could be done by students to conserve fuel?

Carpooling to School

Using the following information, have students figure the costs of commuting to and from school:

Car Size	Vehicle Cost Depre- ciated	Maintenance Accessories, Parts & Tires	Gas & Oil (Excluding Taxes)	Insur- ance	State and Federal Taxes	Total Cost (Per mile)
Standard	4.5¢	3.7¢	5.5¢	1.7¢	1.6¢	= 17¢
Intermediate	4.2¢	3.4¢	5.3¢	1.6¢	1.5¢	= 16¢
Compact	2.9¢	2.7¢	4.7¢	1.5¢	1.2¢	= 13¢
Subcompact	2.3¢	2.5¢	3.8¢	1.5¢	0.9¢	= 11¢

Adapted from U.S. Dept. of Transportation-Federal
Highway Administration Statistics

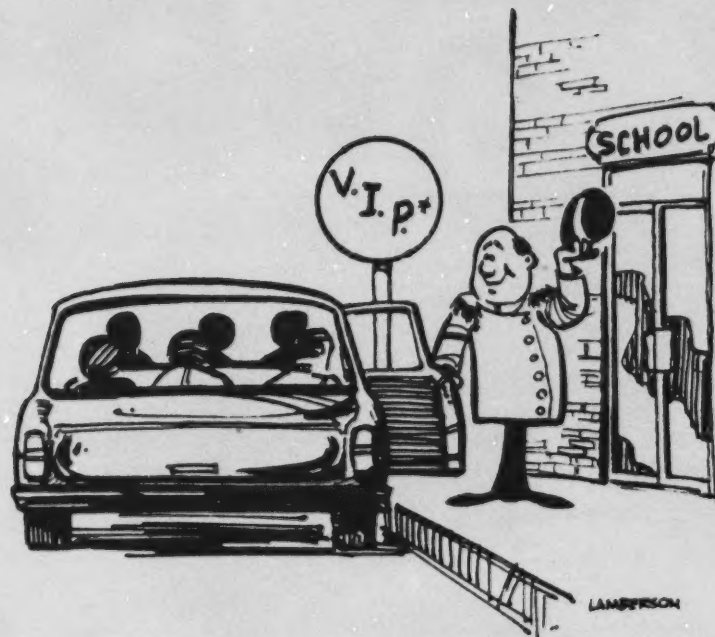
EXAMPLE - How to figure your present committing cost (Standard car-Ford LTD) traveling 15 miles round trip

- | | |
|--|---|
| <p>1. MULTIPLY (.17) x (15) = \$2.55</p> <p style="margin-left: 100px;">Cost Miles</p> <p style="margin-left: 100px;">per per</p> <p style="margin-left: 100px;">mile day</p> <p>2. ADD</p> <p style="margin-left: 20px;">Daily parking cost + 0</p> <p>3. TOTAL DAILY COST = \$2.55</p> <p>4. MULTIPLY DAILY COST</p> <p style="margin-left: 20px;">By number of</p> <p style="margin-left: 20px;">school days per month X 21</p> <p>5. COST PER MONTH TO DRIVE ALONE = \$53.55</p> | <p>6. DIVIDE BY NUMBER OF PEOPLE IN CARPOOL 4</p> <p>7. NEW INDIVIDUAL COST BY CARPOOLING = \$13.39</p> <p>8. MONTHLY CARPOOL SAVING = \$40.16</p> <p>*IMPORTANT - For a successful carpool when the driver-owner does all the driving, fair share rates should be figured on paying riders only. The driver owner should ride free.</p> |
|--|---|

- | | |
|--|--|
| <p>1. MULTIPLY _____ x _____ = \$ _____</p> <p style="margin-left: 100px;">Cost Miles</p> <p style="margin-left: 100px;">per mile per day</p> <p>2. ADD</p> <p style="margin-left: 20px;">Daily parking cost _____</p> <p>3. TOTAL DAILY COST = _____</p> <p>4. MULTIPLY DAILY COST</p> <p style="margin-left: 20px;">By number of school days per month X _____</p> | <p>5. COST PER MONTH TO DRIVE ALONE = _____</p> <p>6. DIVIDE BY NUMBER OF PEOPLE IN CARPOOL = _____</p> <p>7. NEW INDIVIDUAL COST BY CARPOOLING = _____</p> <p>8. MONTHLY CARPOOL SAVING (5 - 7) = _____</p> |
|--|--|



IV. APPENDICES



* ENERGY EFFICIENT DRIVERS
ARE VERY IMPORTANT PEOPLE!

Energy Definitions

Measuring Energy

Specific forms of energy are measured in different ways--barrels of oil, therms or cubic feet of gas, kilowatts or kilowatt-hours of electricity, and tons of coal, for example.

The British thermal unit (Btu) is a standard measurement of energy content no matter what its source.

Other measurements often are converted into Btus to express total energy content or use. Another standard measurement, particularly used for fossil fuels, is "barrels of oil equivalent." In this instance energy values would be converted into the equivalent in barrels of oil.

Here are some of the most-often used energy measurements:

Btu or British thermal unit. The quantity of heat needed to raise the temperature of one pound of water one degree Fahrenheit. One gallon of gasoline = 125,000 Btus.

Barrel. Although seldom put in actual "barrels," crude oil is measured in a unit called the barrel, equal to 42 US gallons; one barrel of crude oil has the same energy as 350 pounds of coal.

Calorie. The amount of heat required to raise the temperature of one gram of water through one degree Centigrade.

DEFINITIONS

Fossil Fuel: Fuels produced from animal and plant materials which were deposited in peat bogs and other areas. It has taken several hundred million years and tremendous temperatures and pressures to change those ancient organic materials into the present deposits of natural gas, crude oil, coal, and others such as tar sands and oil shale.

Petroleum (Rock Oil): A naturally-occurring, flammable liquid composed principally of hydrocarbons. "Crude Oil" is the term used to describe this fossil fuel in its unrefined state. Approximately 46 percent of each barrel of crude oil is refined into gasoline.

Net Energy: The true value of energy to society, the amount available to perform work. NET ENERGY is what remains after the energy costs of extracting, refining, and transporting the type of energy in question. For example, most estimates of our existing energy reserves are GROSS ENERGY calculations, and do not take into account the increasing amounts of energy required to develop them. Our actual net energy reserves are probably much smaller.

Energy Intensiveness: A means of comparing the energy efficiency of various modes of transportation. EI is usually expressed in its units of energy per as the amount of energy (Btus) needed to move one passenger or one ton of goods one mile...Btus/passenger mile or Btus/ton mile. The smaller the number, the more efficient the vehicle.

Average rough estimates of the EI estimates of the EI of various vehicles:

<u>MODE</u>	<u>EI (Btu/PM)</u>
Bicycle	100
Walking	300
Intercity Bus	1300
Intericty Rail	2700
Intercity Auto	3300
Urban Bus	3000
Urban Auto	8100

First Law of Thermodynamics: Energy can't be created or destroyed. The energy of the Universe is constant. "Everything must go somewhere" (Quantity)

Second Law of Thermodynamics: Although energy cannot be destroyed, it does change form...and in so doing is lowered in quality, i.e. its ability to perform work is decreased. This loss of quality is in the form of waste heat.

For Example: When one burns a gallon of gasoline in a car, the energy in the gas is not destroyed..up to 25 percent is changed to mechanical energy to move the car, and the rest is released to the atmosphere as unusable heat.

Energy Efficiency Ratio (EER): In all conversions of energy from one form to another a portion of the original energy is always degraded to unusable heat (Second Law of Thermodynamics). EER is the ratio of the potential energy in a given fuel to the amount of actual work produced by an energy-converting machine or device.

For Example: If we burn a gallon of gasoline in an automobile engine set on a test block and measure the mechanical work output, we find that it amounts to 8,200 calories. The chemical potential energy of the gallon of gasoline is 32,830 calories. The efficiency of the engine, therefore, is

$$E = \frac{8,200 \text{ calories} \times 100}{32,830 \text{ calories}} = 25 \text{ percent}$$

By Comparison: A diesel engine has an EER of about 35 percent; an electric motor that could power a vehicle, about 65 percent. A person on a bicycle is the most efficient of all traveling animals and machines. (1100 mpg.)

Energy Statistics

UNITED STATES:

We comprise only 5½ percent of the World's population, but use about 33 per cent of the total energy.

Our per capita energy in the U.S. is about 310 million Btu/ per person annually as compared to Sweden (163 Btu), U.S.S.R. (122 Btu), Canada (257.7 Btu), India (6 Btu).

Transportation accounts for 25 percent of our total energy use in the U.S.

Private autos use 14 percent of our total energy budget, 31 percent of all petroleum consumed.

46 percent of every barrel of crude oil is refined to gasoline to be burned in our motorized vehicles.

U.S. oil fields are replenishing their supplies through natural processes at the rate of 10 barrels a day. The U.S. uses more than 17 million barrels per day. This is to say that we are currently using as much oil in 3 hours as oil deposits have produced in 5 centuries. (From the Minneapolis Tribune via Alternative Sources of Energy)

The average auto travels 10,000 miles a year and uses well over 650 gallons of gas.

More than one-half of all auto trips are less than 5 miles in length.

Most estimates show our domestic supplies of petroleum being exhausted by the year 2000. (We presently import about 50 percent of what we use.)

If the fuel consumption of the average auto was cut by 15 percent, the U.S. petroleum demand would be reduced by 28 million gallons/day.

If just 1 gallon of gasoline were saved each week for every automobile in the country, we'd save about 5.2 billion gallons of gasoline in a year or about 7 percent of the demand created by all our passenger cars.

IDAHO:

In 1975 our total energy use was 227.9 trillion Btus. 33 percent of that total (about 74.6 trillion Btus) was used by the transportation sector.

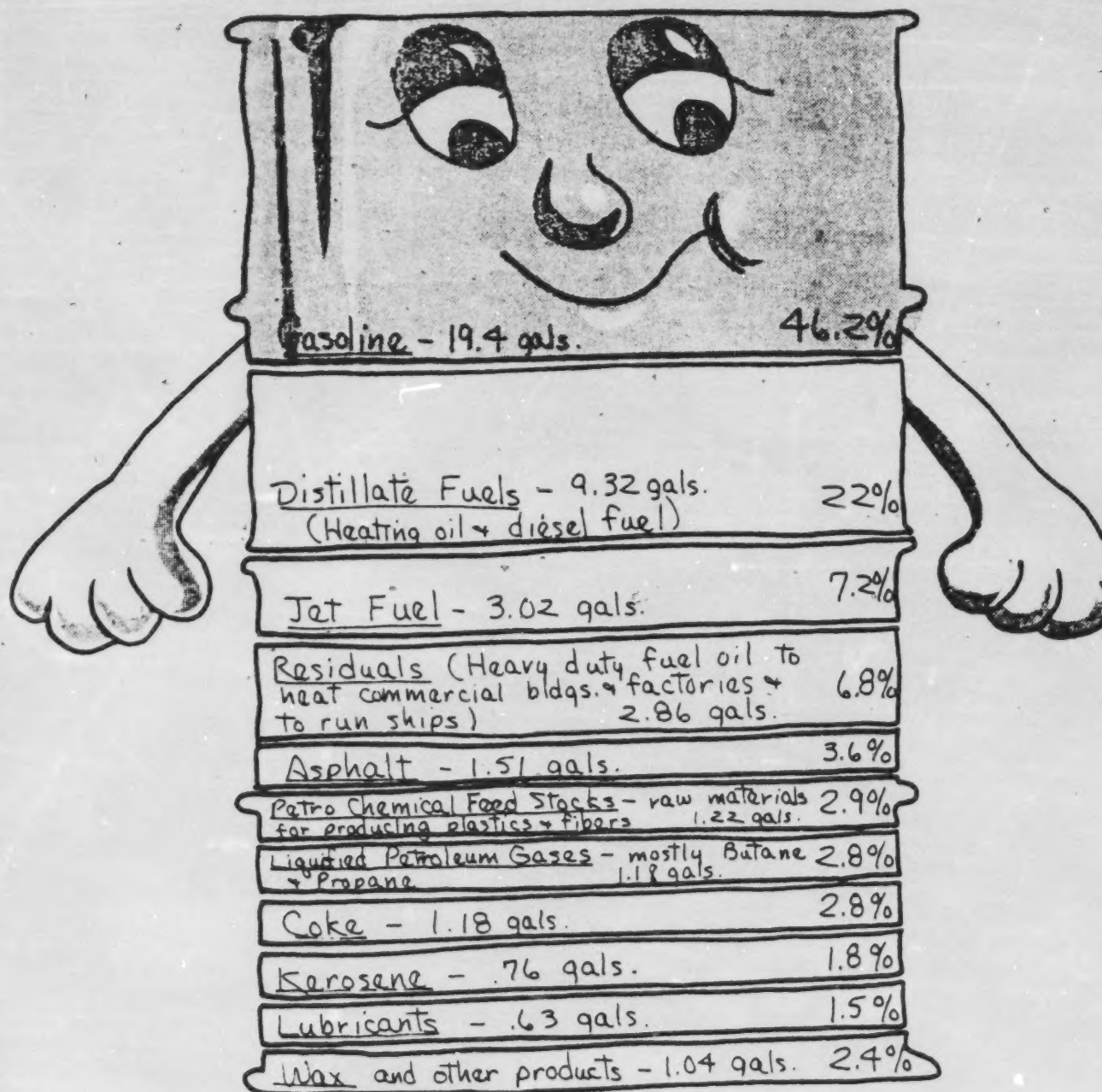
Automobiles and small trucks account for 70 percent of all the energy used by transportation. Of this amount (50 trillion Btus annually) nearly 37.5 trillion Btus are converted to unusable heat waste heat.

Energy Conversion Table

To Convert From	To Btus	Multiply by
kwh	to Btu	3,400
hph (horsepower hour)	to Btu	2,544
1 lb. bituminous coal	to Btu	13,100
1 ton bituminous coal	to Btu	26,200,000
1 ton coke	to Btu	24,800,000
1 bbl. crude oil	to Btu	5,800,000
1 bbl. residual oil #5	to Btu	6,287,400
1 bbl. distillate fuel oil	to Btu	5,825,400
1 bbl. gasoline (motor fuel)	to Btu	5,218,080
1 gal. gasoline (motor fuel)	to Btu	124,240
1 bbl. gasoline (aviation)	to Btu	5,048,400
1 gal. gasoline (aviation)	to Btu	120,200
1 cubic foot natural gas	to Btu	1,032
1 cubic foot manufactured gas	to Btu	540
1 therm natural gas	to Btu	100,000
1 bbl. tar and pitch	to Btu	6,720,000
1 bbl. kerosene	to Btu	5,670,000
1 cord wood (128 cubic feet)	to Btu	20,960,000
1 K cal	to Btu	0.25

CHART I

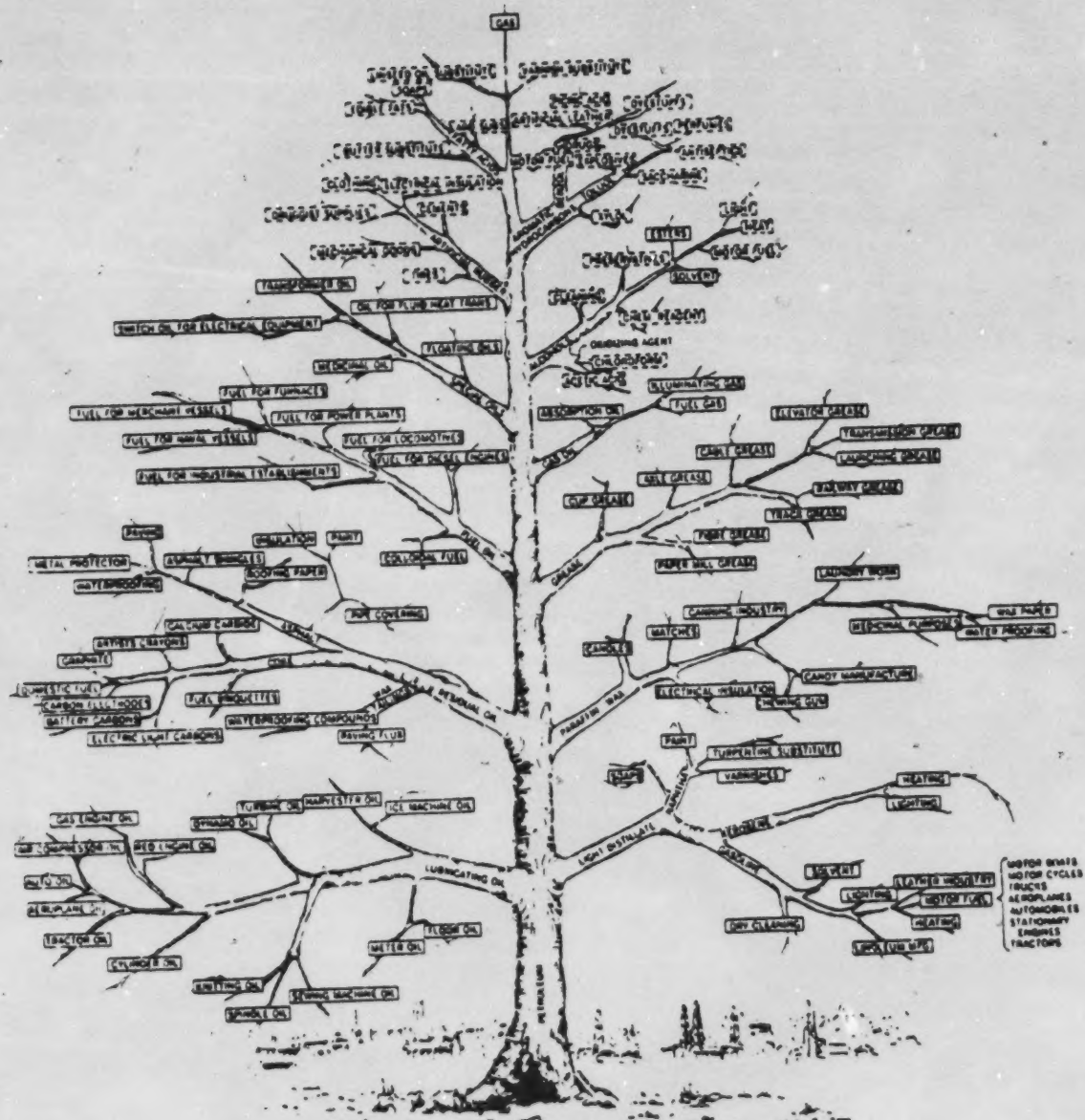
How a Barrel of Crude Oil Is Refined Into Various Petroleum Products in a Typical Refinery



Crude Oil
42 Gallon Barrel

University of Tennessee Environment Center, 1974

CHART II



THE PETROLEUM TREE
(Products obtainable from crude oil)
Dotted frames indicate probable future products

(U.S. Dept. of Interior
Bureau of Mines)

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**Some things are
worth saving...**

LIKE ENERGY!



TRANSPARENCY MASTERS

Supplement I
to the Driver Education Energy Packet

IDAHO OFFICE OF ENERGY
Fall, 1978

TRANSPARENCY MASTERS

Supplement I to the Driver Education Energy Packet



John V. Evans
Governor

by

Donna Kemp
Transportation Program Manager

Kathy Puckett
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L. KIRK HALL
DIRECTOR

Fall, 1978

M E M O R A N D U M

TO: Driver's Education Teachers

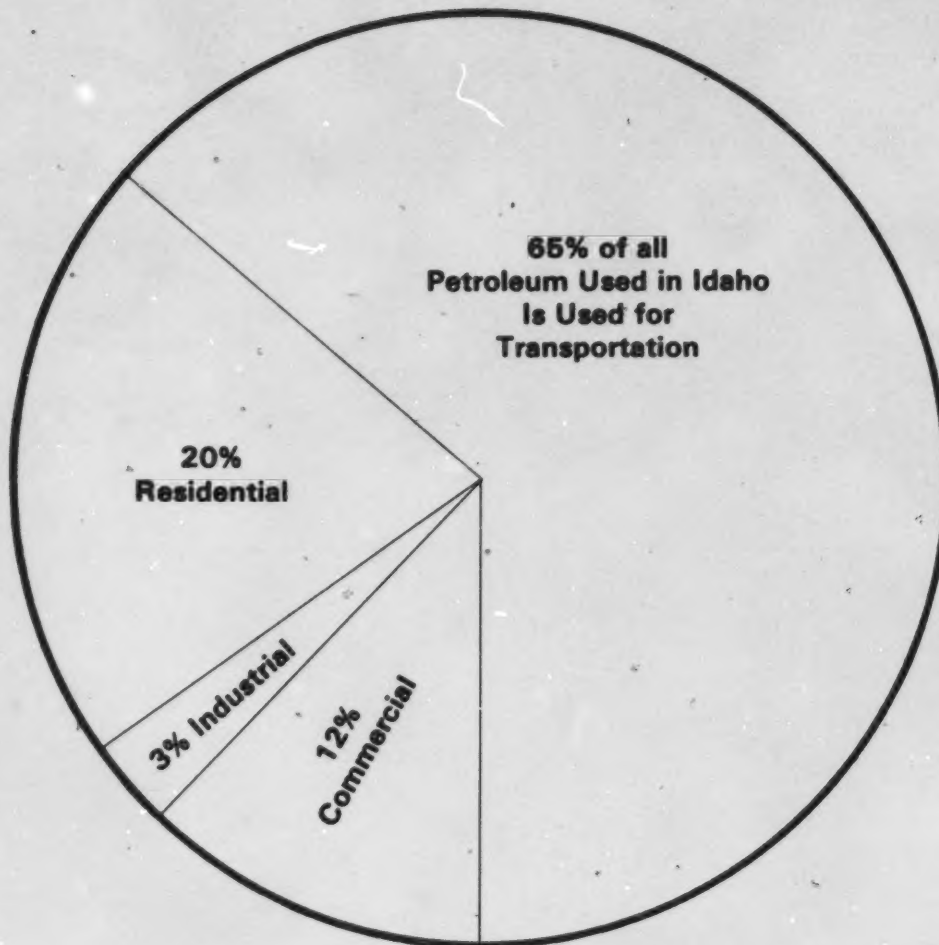
FROM: Idaho Office of Energy

SUBJECT: Supplements to the Driver Education Energy Packet

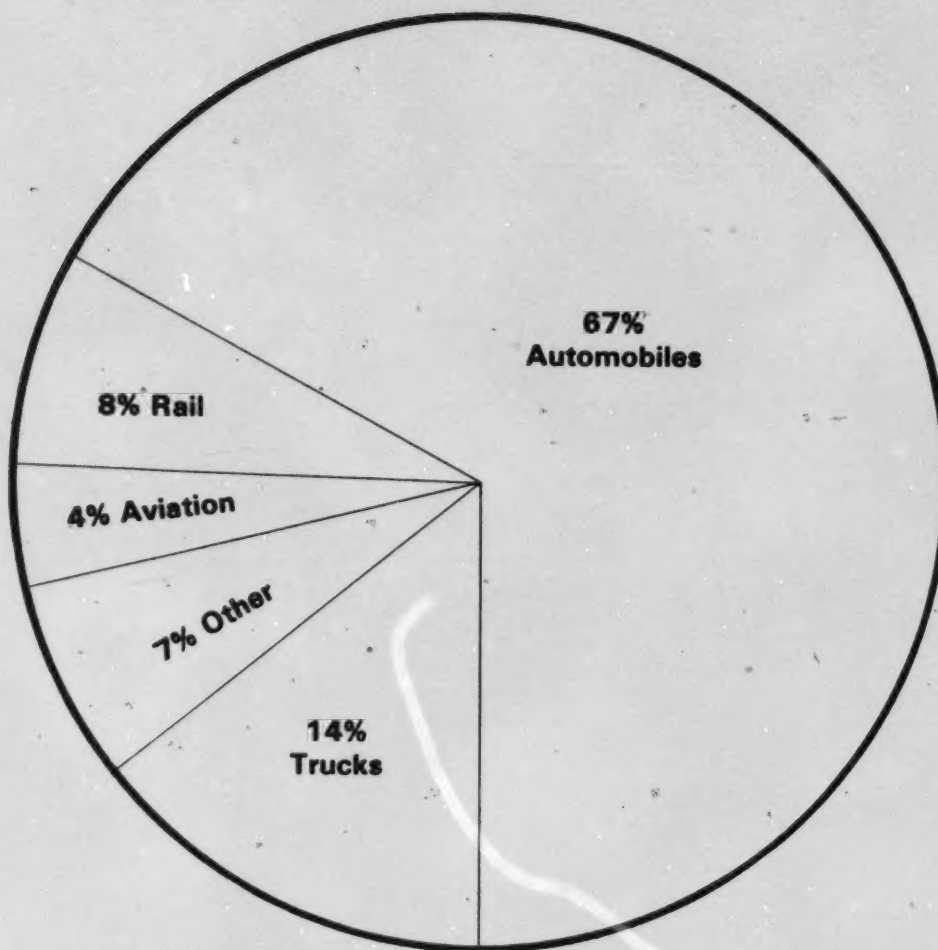
Last fall the Idaho Office of Energy distributed a Driver Education Energy Packet to driver's education teachers. This year we are providing supplements to that packet consisting of additional brochures, a set of overhead projector transparency masters, and a set of flip charts.

The flip charts are on fuel saving tips and provide cartoon illustrations of the fuel saving tips given on pages 16 to 21 of last years Driver Education Energy Packet. There are also transparency masters of those fuel saving tips included in this supplement.

We hope you will find these supplements helpful in teaching fuel efficient driving to your students.



**TOTAL IDAHO PETROLEUM USE
1977**



HOW IDAHO PETROLEUM IS USED 1977

WE AMERICANS ARE QUICK TO FAULT DETROIT, OIL COMPANIES, THE FEDERAL GOVERNMENT, WHOEVER, FOR OUR ENERGY PROBLEMS WHEN IN TRUTH AND IN FACT, WE, YOU AND I, ONLY 5½ PERCENT OF THE WORLD'S POPULATION USE 31 PERCENT OF THE WORLD'S OIL PRODUCTION. AUTOMOBILE MANUFACTURERS, OIL COMPANIES AND GOVERNMENTS ARE NOT EXCLUSIVE TO THE UNITED STATES, WE MUST LOOK TO OURSELVES, 216 MILLION INDIVIDUALS WHO STILL HAVE THE FREEDOM TO CONSERVE OR TO WASTE. EACH OF US HAS A DECISION TO MAKE.

—North Dakota Energy
Management and Conservation

**"THE NATION'S DRIVERS HAVE
THE POTENTIAL TO SAVE
THE TOTAL ENERGY
EQUIVALENT USED FOR
HEATING WATER, COOKING,
REFRIGERATION, WASHING
AND DRYING CLOTHES AND
DISHES AND OTHER APPLIANCES
IN ALL 70 MILLION U.S.
HOUSEHOLDS."**

*—North Dakota Energy
Management and Conservation*

Vehicle Use Efficiency



Depends On



How It Is Operated



Where It Is Used



How Well It Is Maintained

"THE DRIVING TECHNIQUE OF THE INDIVIDUAL BEHIND THE WHEEL IS THE MOST IMPORTANT SINGLE ELEMENT IN DETERMINING FUEL ECONOMY OF THE AVERAGE CAR. A CAREFUL DRIVER CAN GET AT LEAST 30 PERCENT MORE MILEAGE THAN THE AVERAGE DRIVER AND 50 PERCENT MORE THAN THE CARELESS ONE."

—Federal Energy Administration

FUEL ECONOMY LABELS



SAMPLE

Based on EPA certified tests of vehicles equipped with frequently purchased options, the typical gas mileage of this type of vehicle is estimated to be:

21 MPG CITY, 28 MPG HIGHWAY, 24 MPG COMBINED
6 CYL, 200 1V ENG, CATALYST, AUTOMATIC TRANS

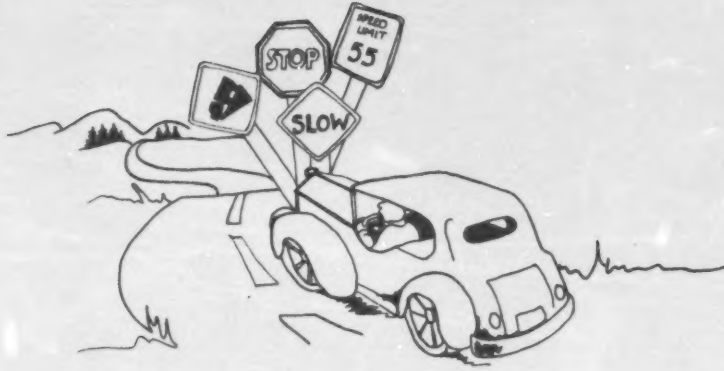


FUEL COST TO DRIVE THIS VEHICLE 15,000 MILES IS ESTIMATED TO BE \$375 (\$25.00/GAL). GAS MILEAGE OF COMPARABLE VEHICLES WAS NOT AVAILABLE WHEN VEHICLE WAS BUILT.

Your dealer has a free booklet showing gas mileage of all 1978 models and how tests were run.

Your actual gas mileage will depend on the type of driving you do, your driving habits, how well you maintain your vehicle, optional equipment installed and road and weather conditions.

FUEL SAVING TIPS



I. IMPROVE YOUR DRIVING SKILLS

1. START SLOWLY
2. AVOID UNNECESSARY BRAKING AND TRY TO ANTICIPATE THE TRAFFIC AHEAD
3. DRIVE AT MODERATE SPEEDS
4. DRIVE AT STEADY SPEEDS
5. OBSERVE THE 55-mph SPEED LIMIT
6. SAVE GAS WHEN CHANGING GEARS
7. AVOID UNNECESSARY USE OF AIR CONDITIONING EQUIPMENT
8. AVOID EXCESSIVE IDLING
9. BREAK GAS-WASTING HABITS

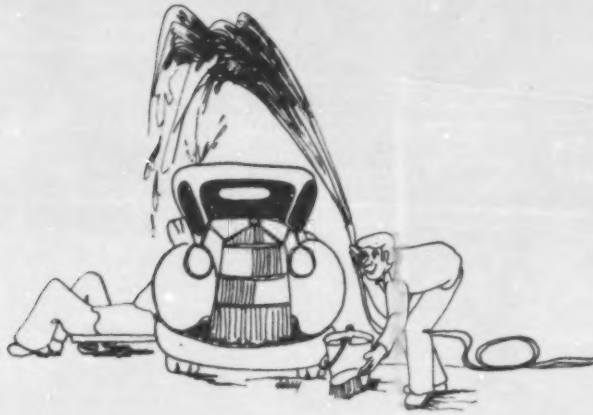
FUEL SAVING TIPS



II. IMPROVE YOUR TRIP PLANNING

1. JOIN A CARPOOL
2. PLAN SHORT TRIPS CAREFULLY
3. CONSOLIDATE YOUR DRIVING
4. PRE-PLAN YOUR TRIPS
5. THINK ECONOMICALLY
6. ELIMINATE UNNECESSARY TRIPS

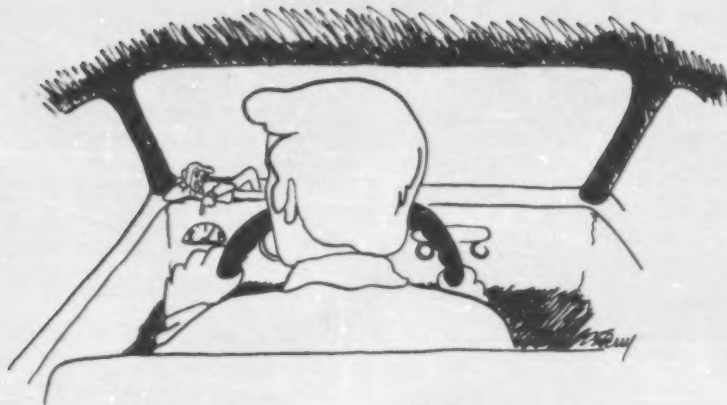
FUEL SAVING TIPS



III. MAINTENANCE AND CAR CARE

1. GET A TUNE-UP
2. KEEP THE ENGINE AIR FILTER CLEAN
3. CHECK TIRE PRESSURES REGULARLY
4. CONSIDER BUYING RADIAL TIRES
5. MAKE SURE YOUR WHEELS ARE PROPERLY ALIGNED
6. ADJUST BRAKES CORRECTLY
7. DON'T CARRY UNNECESSARY WEIGHT
8. CHANGE OIL AND OIL FILTER AT RECOMMENDED INTERVALS
9. USE A GOOD QUALITY MULTI-GRADE (MULTI-VISOCOSITY) OIL HAVING AN API SAE RATING ON THE CONTAINER

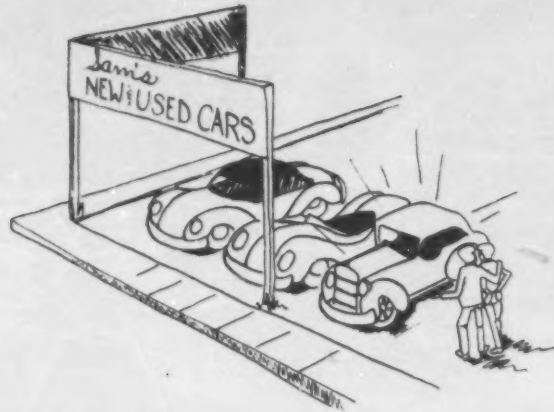
FUEL SAVING TIPS



IV. BECOME AWARE OF GAS USAGE

1. KEEP A CHECK ON MILES PER GALLON
2. CONSIDER INSTALLING A MILES-PER-GALLON METER OR A MANIFOLD VACUUM GAUGE
3. BUY GAS ONLY WHEN THE GAUGE SHOWS A QUARTER TANK OR LESS
4. USE GASOLINE OF THE PROPER OCTANE RATING
5. DON'T LET THE GAS STATION ATTENDANT OVERFILL YOUR TANK

FUEL SAVING TIPS



V. NEW CAR SELECTION

1. STUDY EPA/DOE GAS MILEAGE CHARTS BEFORE BUYING A CAR
2. CONSIDER VEHICLE WEIGHT
3. FOUR-CYLINDER ENGINES CONSUME LESS FUEL THAN SIX OR EIGHT-CYLINDER ENGINES
4. CONSIDER FUEL USE IN AIR-CONDITIONING
5. CONVENIENCE ACCESSORIES SUCH AS AUTOMATIC TRANSMISSION AND POWER STEERING ADD TO FUEL CONSUMPTION
6. DIESEL ENGINES ARE MORE FUEL EFFICIENT
7. OVERDRIVE OPTIONS AND CRUISE CONTROL CAN SAVE ON FUEL
8. LIGHT COLORS REDUCE HEAT ABSORPTION
9. USE TINTED GLASS TO REDUCE NEED FOR AIR CONDITIONING
10. FUEL INJECTION USUALLY SAVES FUEL
11. AN ELECTRONIC IGNITION SYSTEM IS A FUEL SAVER
12. RADIAL PLY TIRES ALLOW BETTER GAS MILEAGE

ADDITIONAL FUEL SAVING TIPS:

FACTORS THAT AFFECT FUEL ECONOMY AND EPA FUEL RATING

1. TEMPERATURE

Summer temperatures (over 70° F) are better for fuel economy than winter temperatures.

2. WIND

Tailwinds increase fuel economy.

Sidewinds and headwinds decrease fuel economy.

3. PRECIPITATION

Rain or snow can decrease fuel economy.

4. ROAD CONDITIONS

Rough or loose road surface can cause a fuel economy loss.

Hilly or mountainous roads cause fuel loss.

5. HOW YOU DRIVE

A warm engine (one used in the last four (4) hours) uses less fuel than a "cold" engine.

Shorter trips (under 5 miles) are not as fuel efficient as longer trips.



FUEL SAVING TIPS

Supplement II
to the
Driver Education
Energy Packet

Idaho Office of Energy
Fall 1978

FUEL SAVING TIPS

**Supplement II
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Driver Education Energy Packet**



**John V. Evans
Governor**

by

**Donna Kemp
Transportation Program Manager**

**Kathy Puckett
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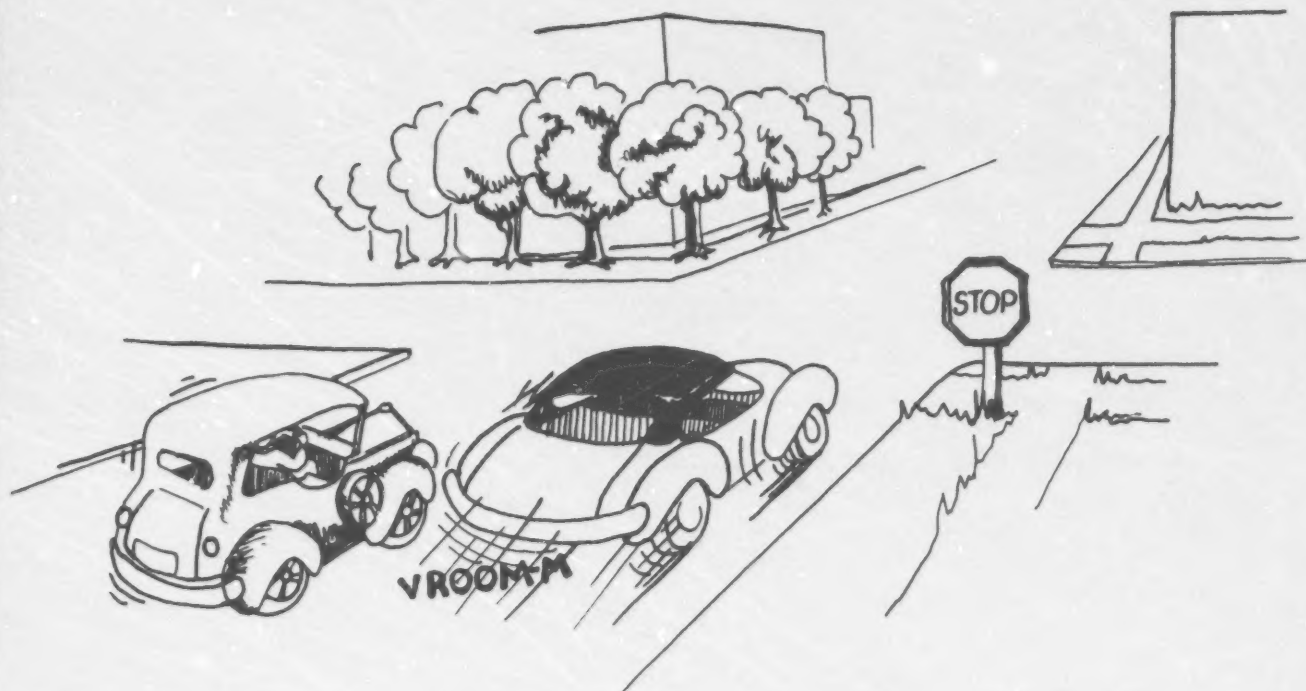
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FUEL SAVING TIPS: SECTION I

Improve Your Driving Skills





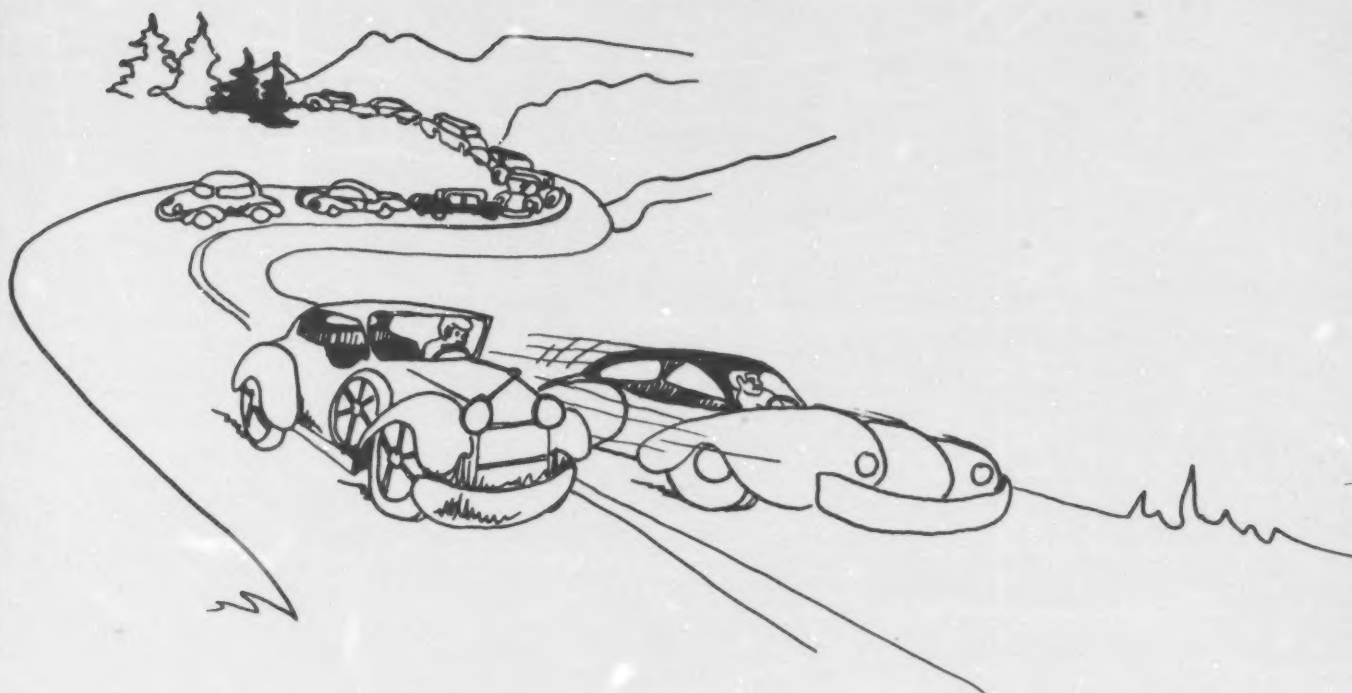
Start slowly.

I. Improve your driving skills: Fuel Saving Tip No. 1



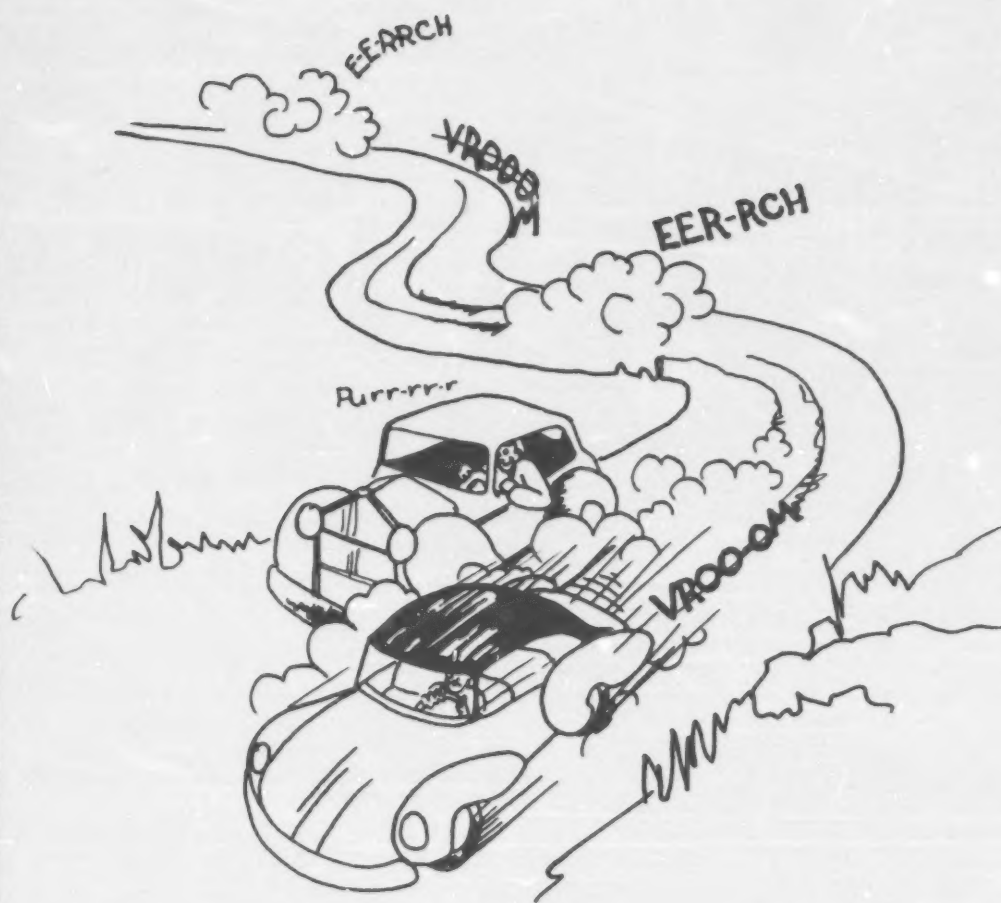
**Avoid unnecessary braking and try to
anticipate the traffic ahead.**

I. Improve your driving skills: Fuel Saving Tip No. 2



Drive at moderate speeds.

I. Improve your driving skills: Fuel Saving Tip No. 3



Drive at steady speeds.

I. Improve your driving skills: Fuel Saving Tip No. 4



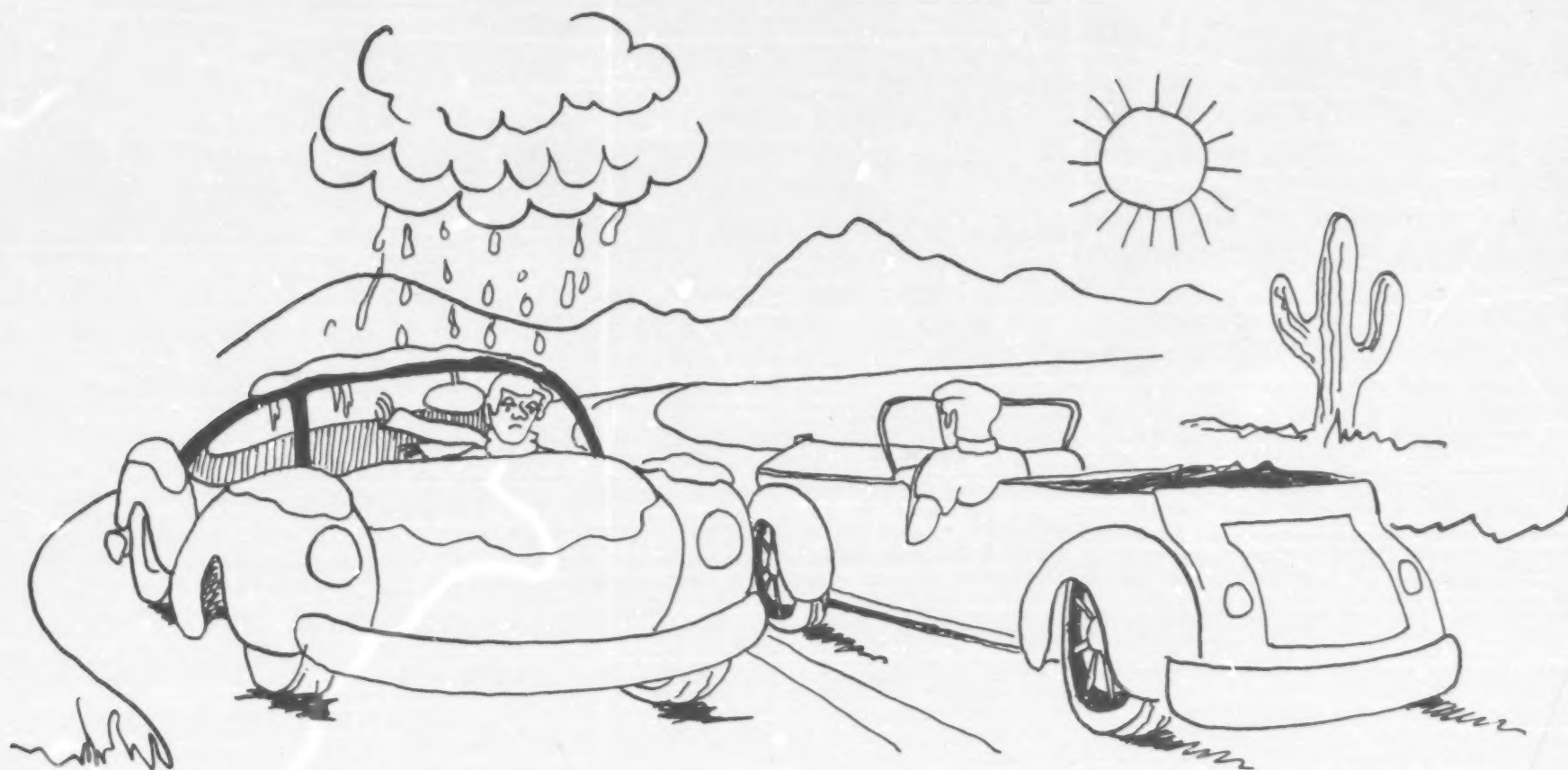
Observe the 55 mph speed limit.

I. Improve your driving skills: Fuel Saving Tip No. 5



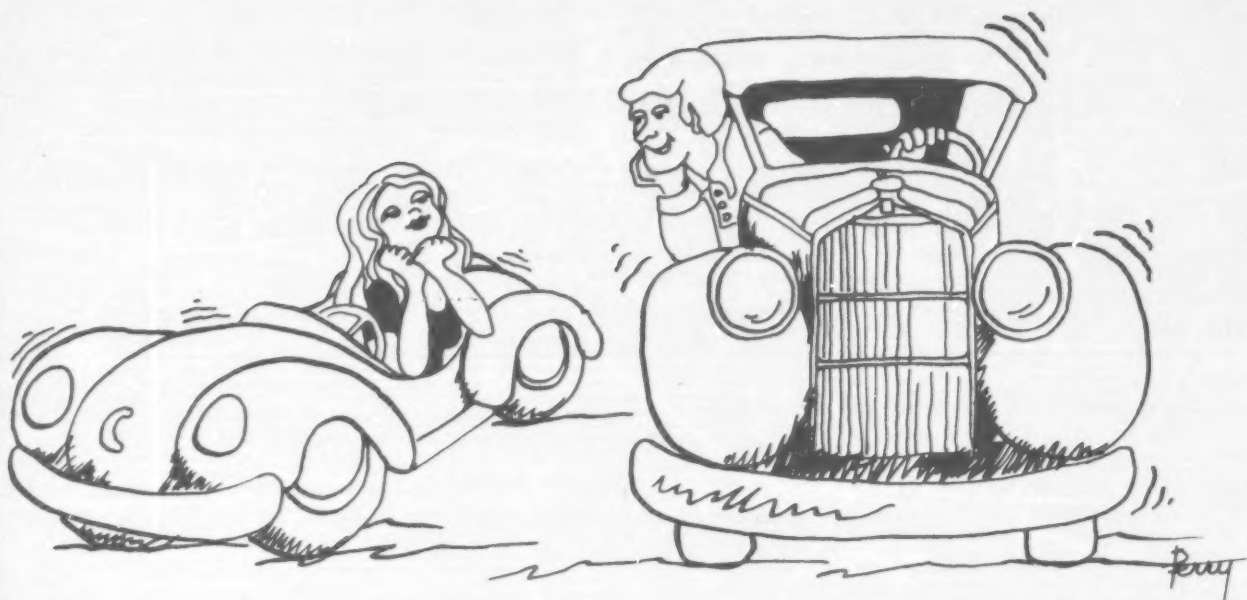
Save gas when changing gears.

I. Improve your driving skills: Fuel Saving Tip No. 6



**Avoid unnecessary use of
air conditioning equipment.**

I. Improve your driving skills: Fuel Saving Tip No. 7



Avoid excessive idling.

I. Improve your driving skills: Fuel Saving Tip No. 8



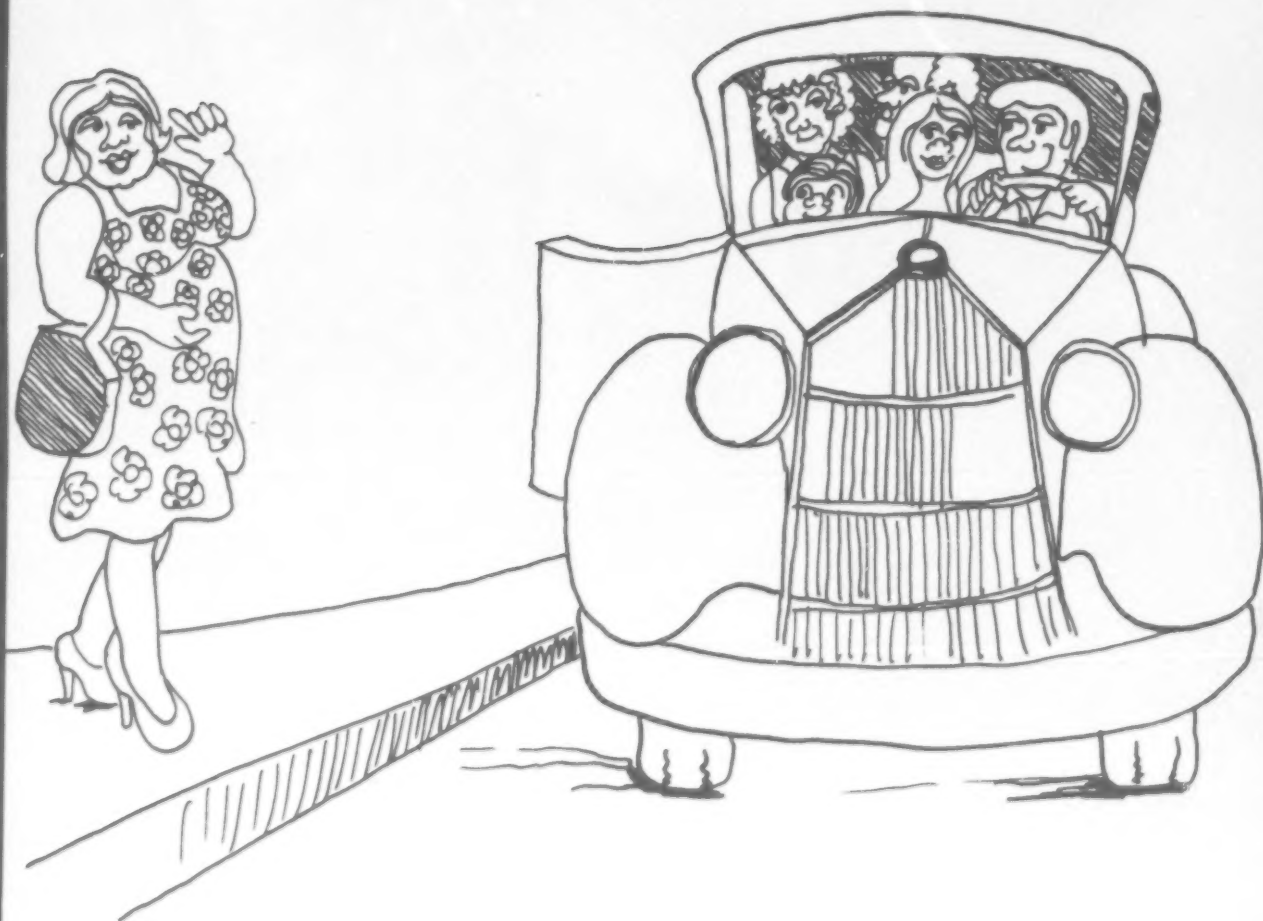
Break gas-wasting habits.

I. Improve your driving skills: Fuel Saving Tip No. 9

FUEL SAVING TIPS: SECTION II

Improve Your Trip Planning





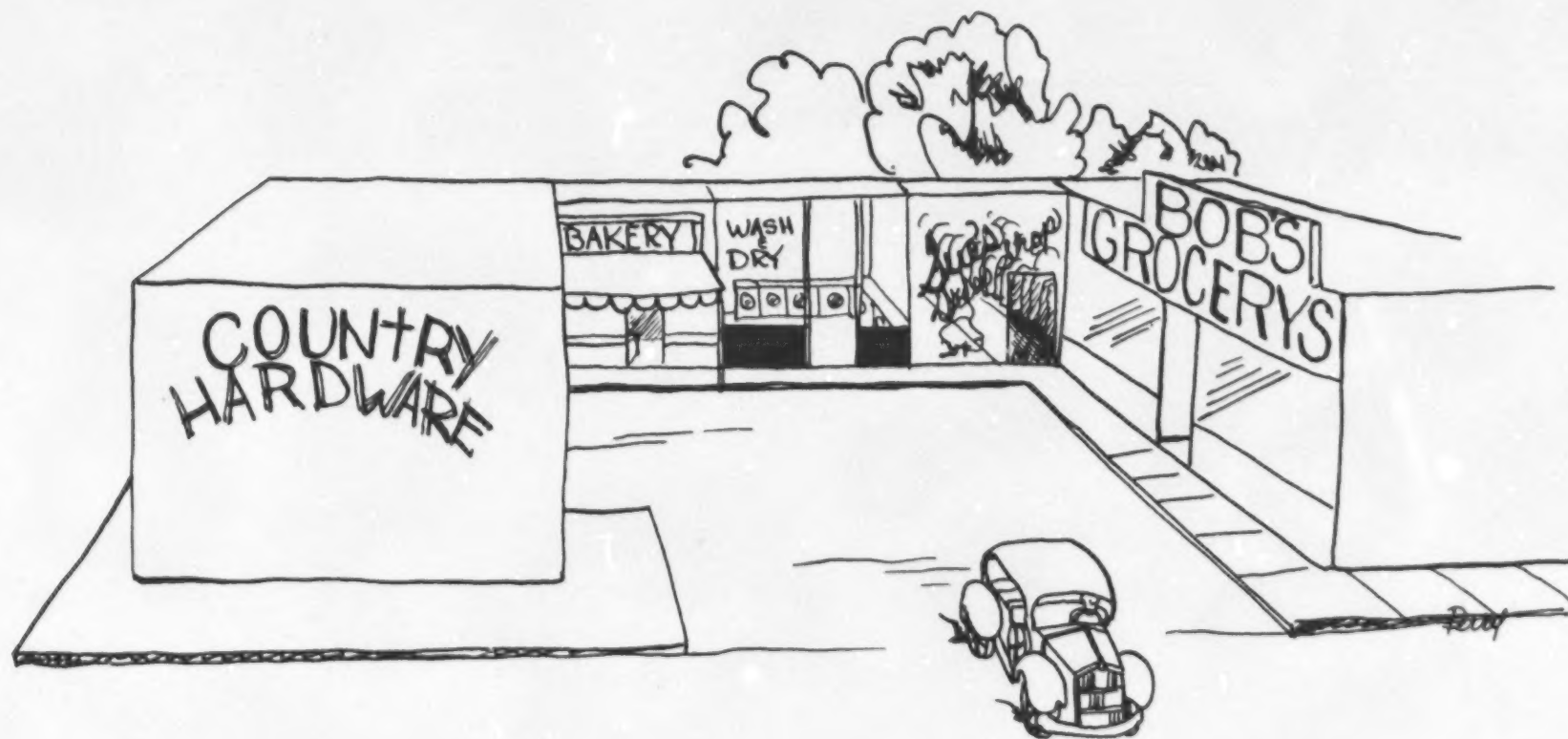
Join a carpool.

II. Improve your trip planning: Fuel Saving Tip No. 1



Plan short trips carefully.

II. Improve your trip planning: Fuel Saving Tip No. 2



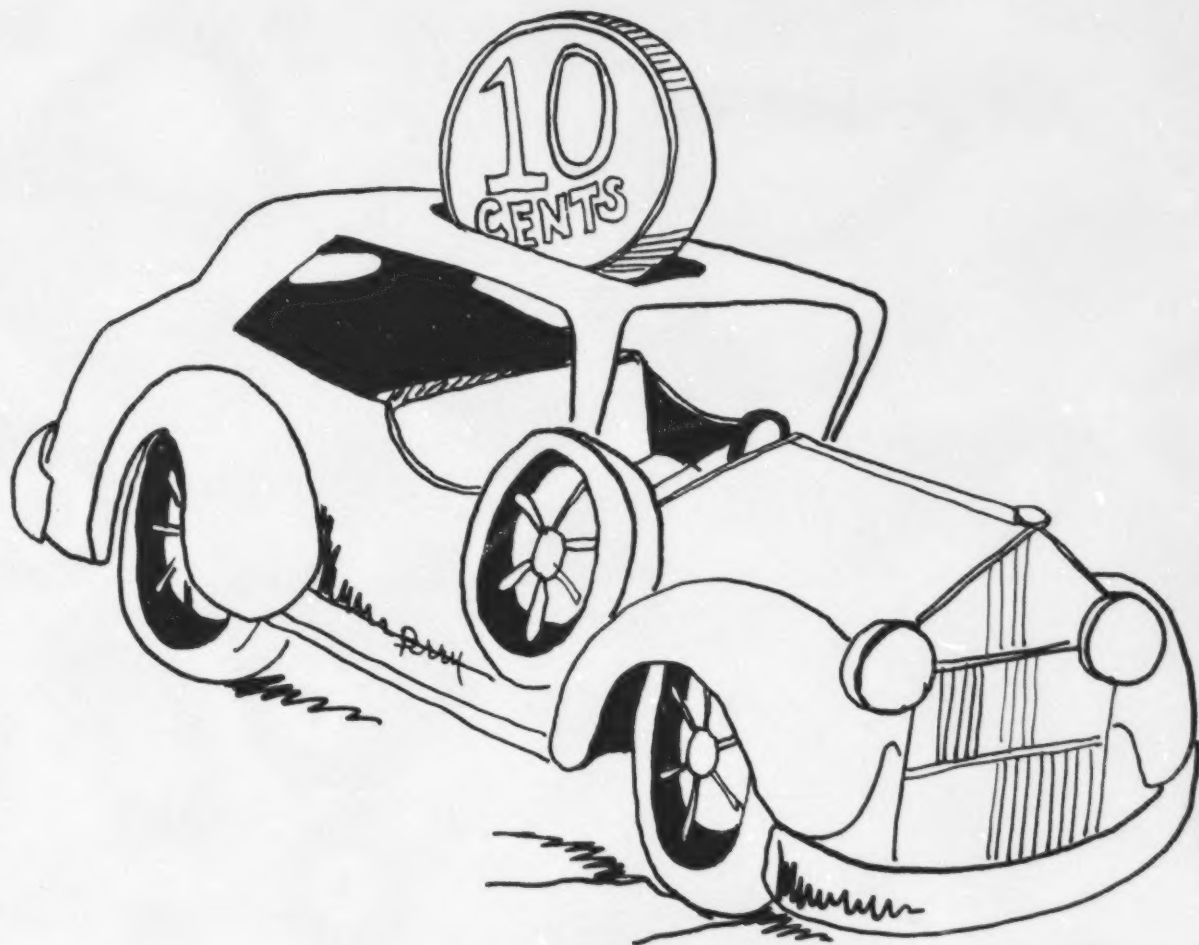
Consolidate your driving.

II. Improve your trip planning: Fuel Saving Tip No. 3



Pre-plan your trips.

II. Improve your trip planning: Fuel Saving Tip No. 4



Think economically.

II. Improve your trip planning: Fuel Saving Tip No. 5

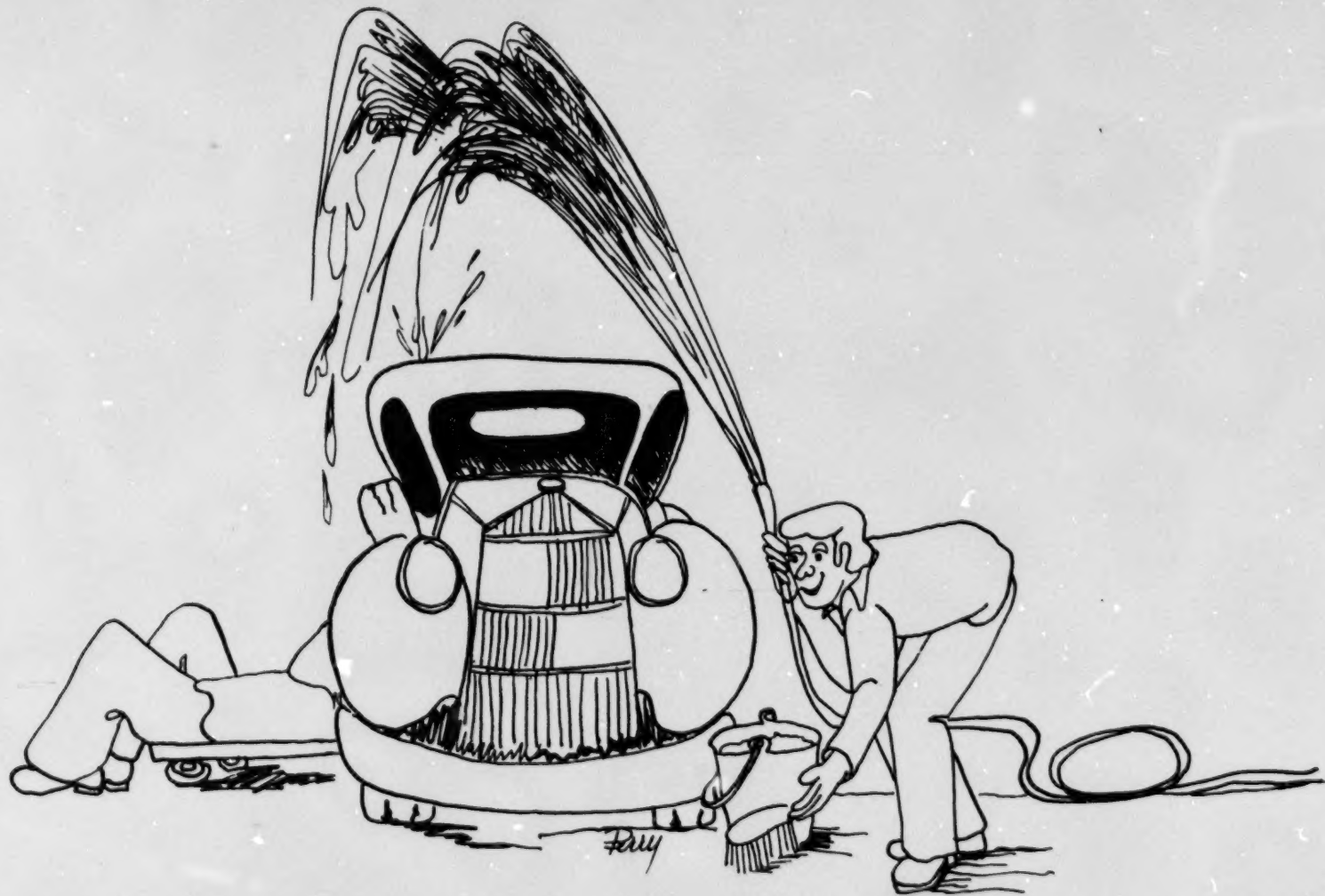


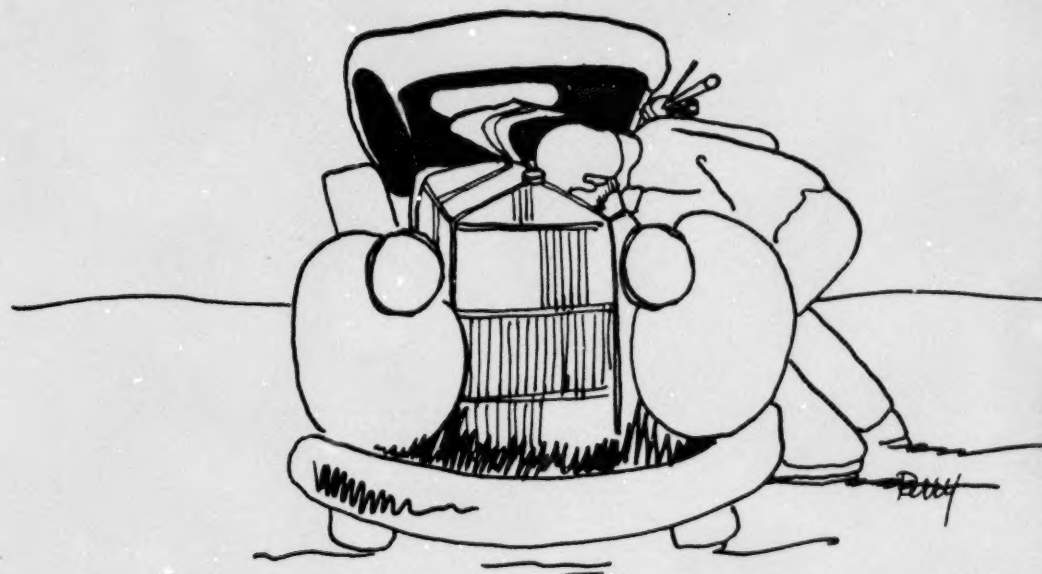
Eliminate unnecessary trips.

II. Improve your trip planning: Fuel Saving Tip No. 6

FUEL SAVING TIPS: SECTION III

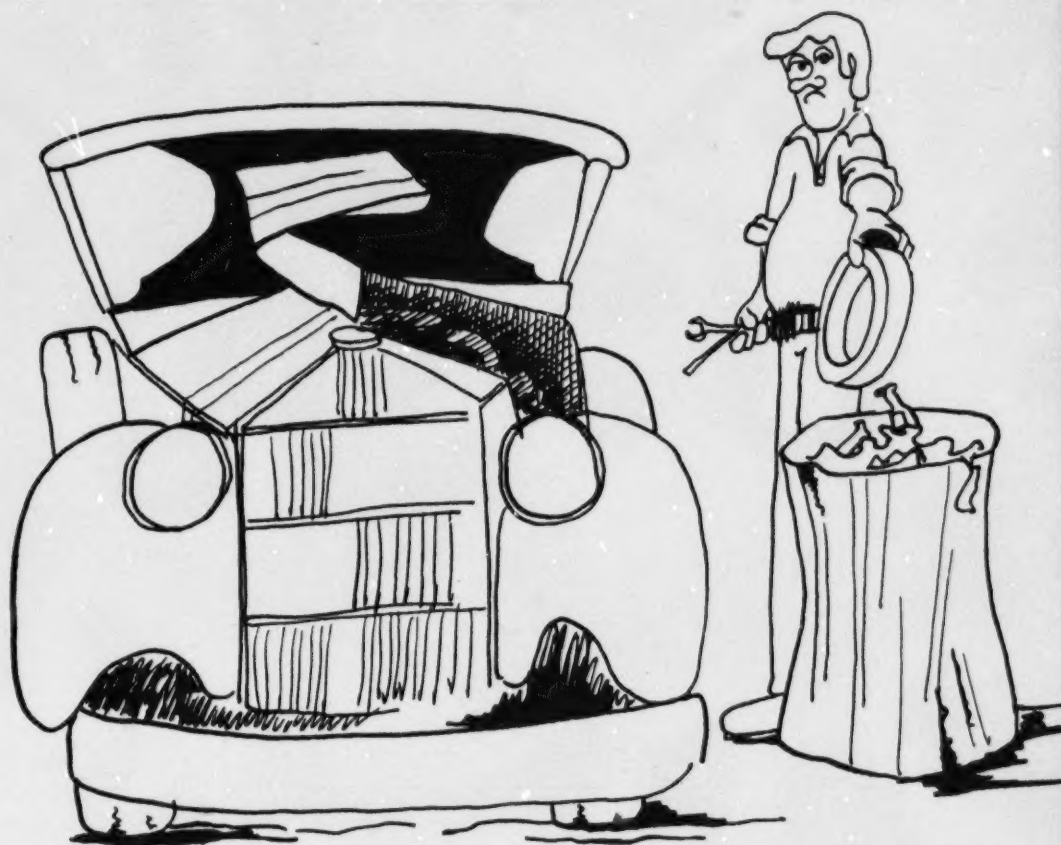
Maintenance and Car Care





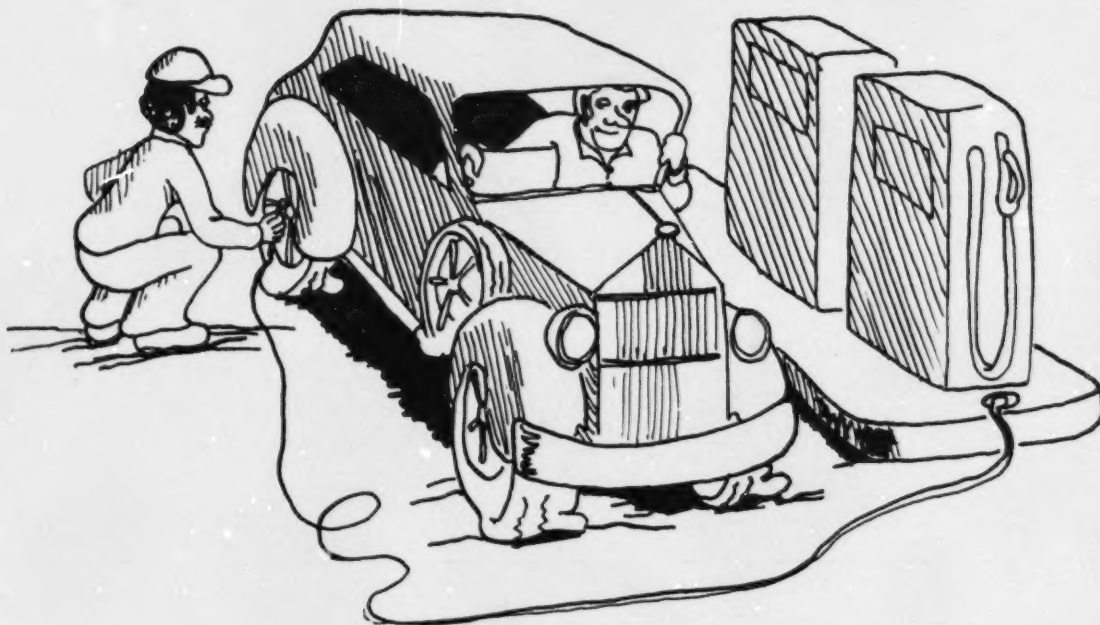
Get a tune-up.

III. Maintenance and Car Care: Fuel Saving Tip No. 1



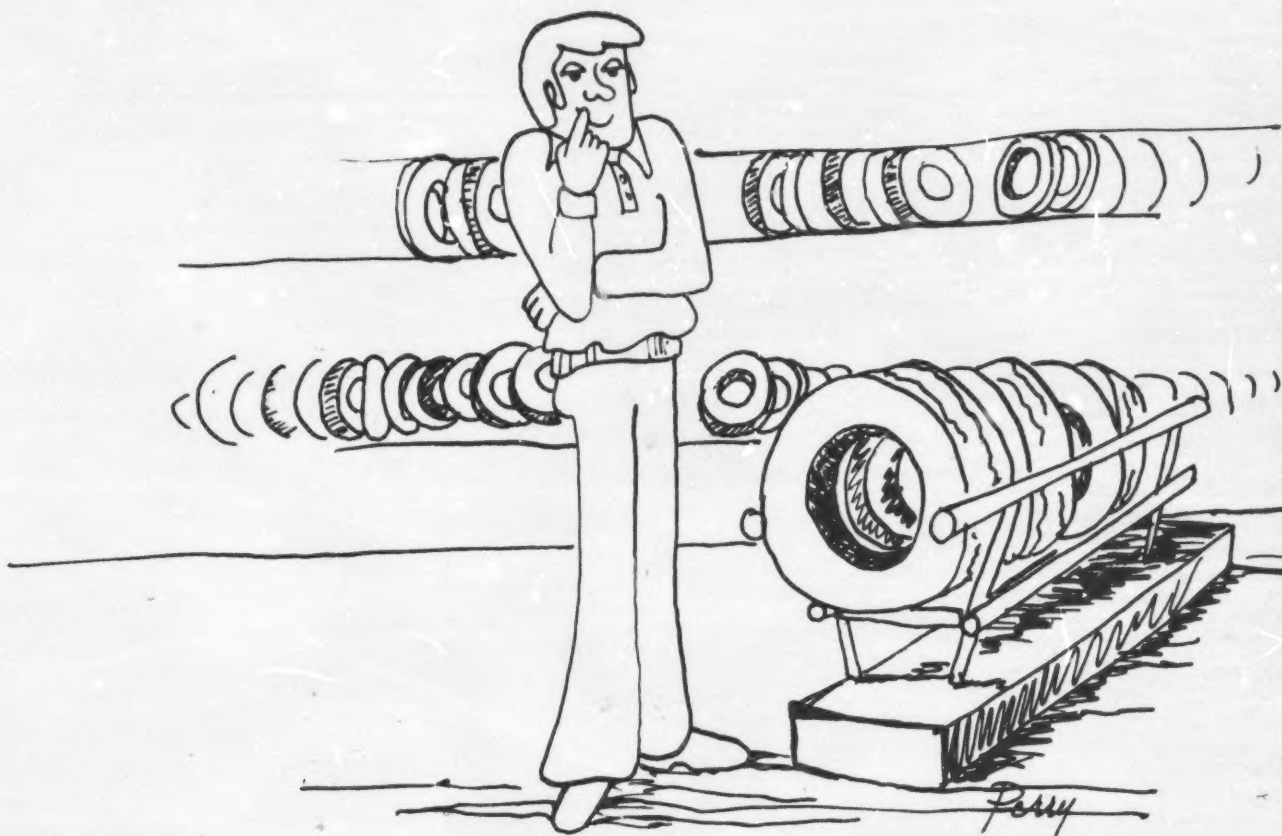
**Keep the engine air
filter clean.**

III. Maintenance and Car Care: Fuel Saving Tip No. 2



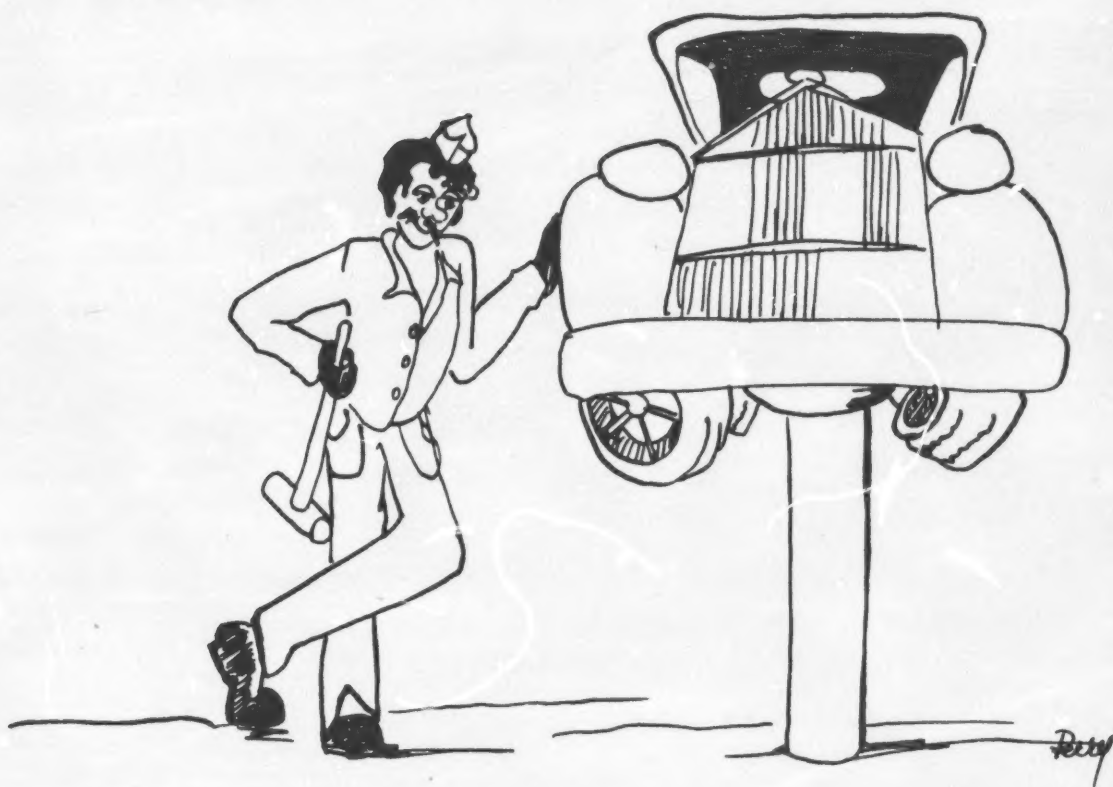
Check tire pressures regularly.

III. Maintenance and Car Care: Fuel Saving Tip No. 3



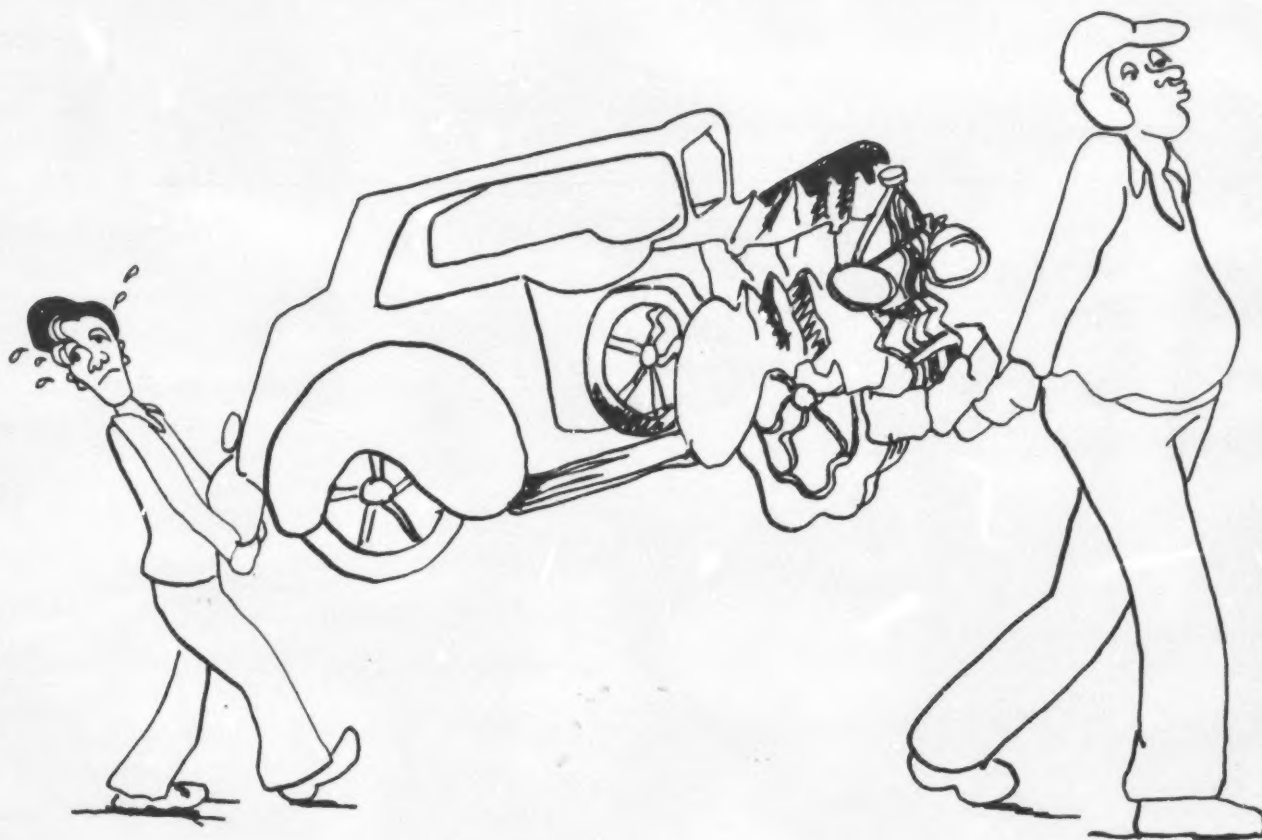
Consider buying radial tires.

III. Maintenance and Car Care: Fuel Saving Tip No. 4



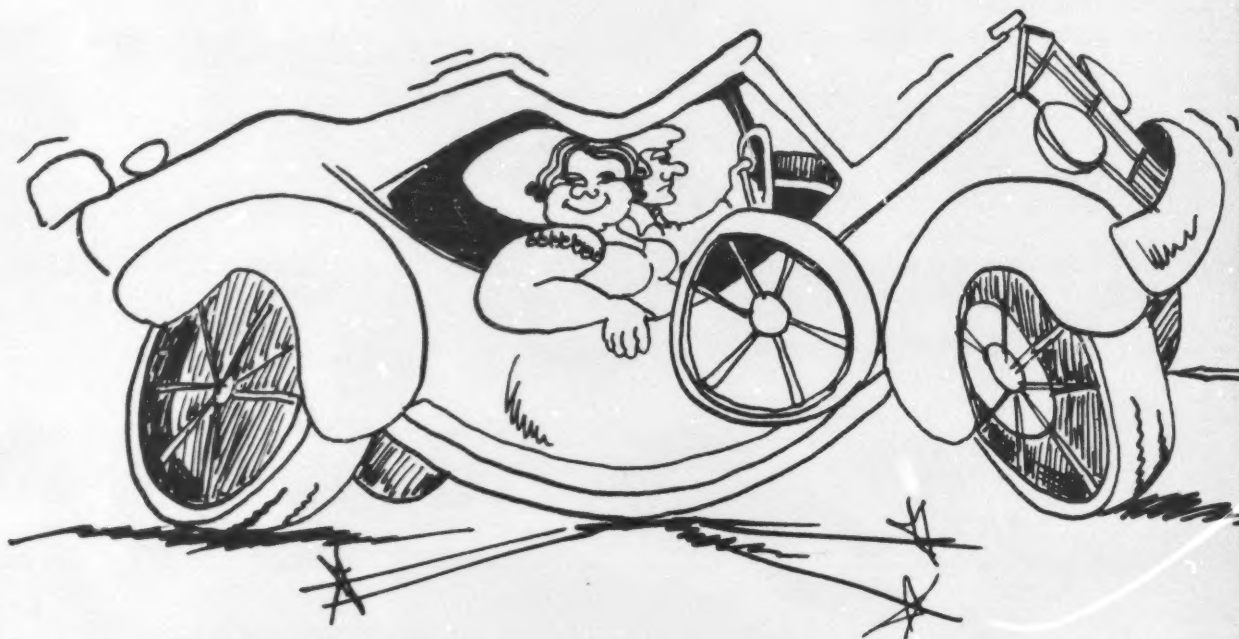
**Make sure your wheels
are properly aligned.**

III. Maintenance and Car Care: Fuel Saving Tip No. 5



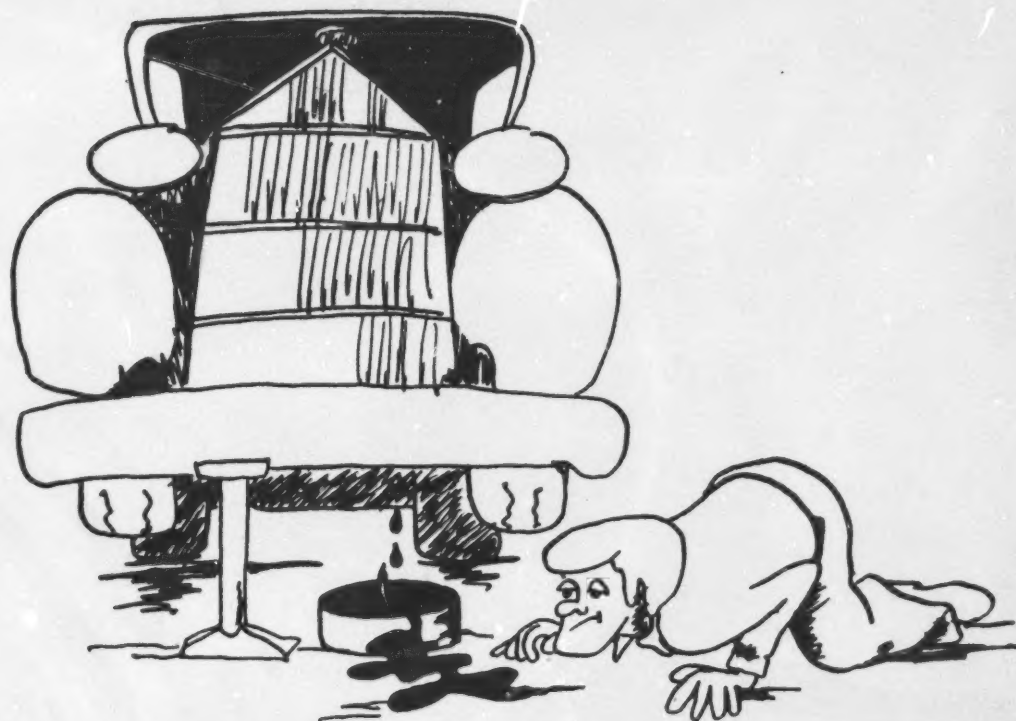
Adjust brakes correctly.

III. Maintenance and Car Care: Fuel Saving Tip No. 6



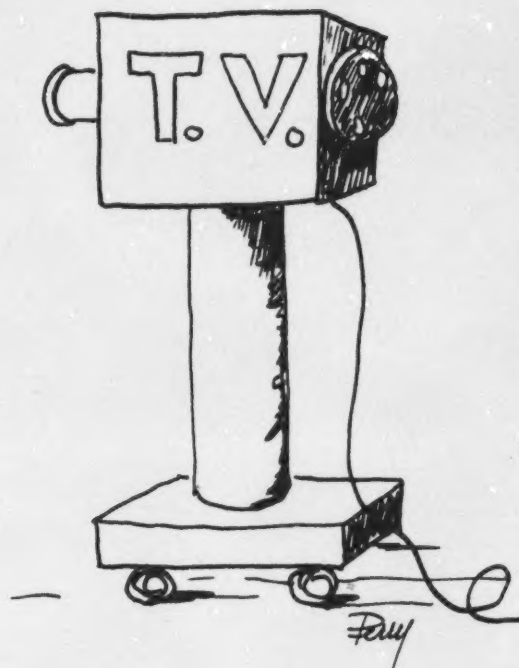
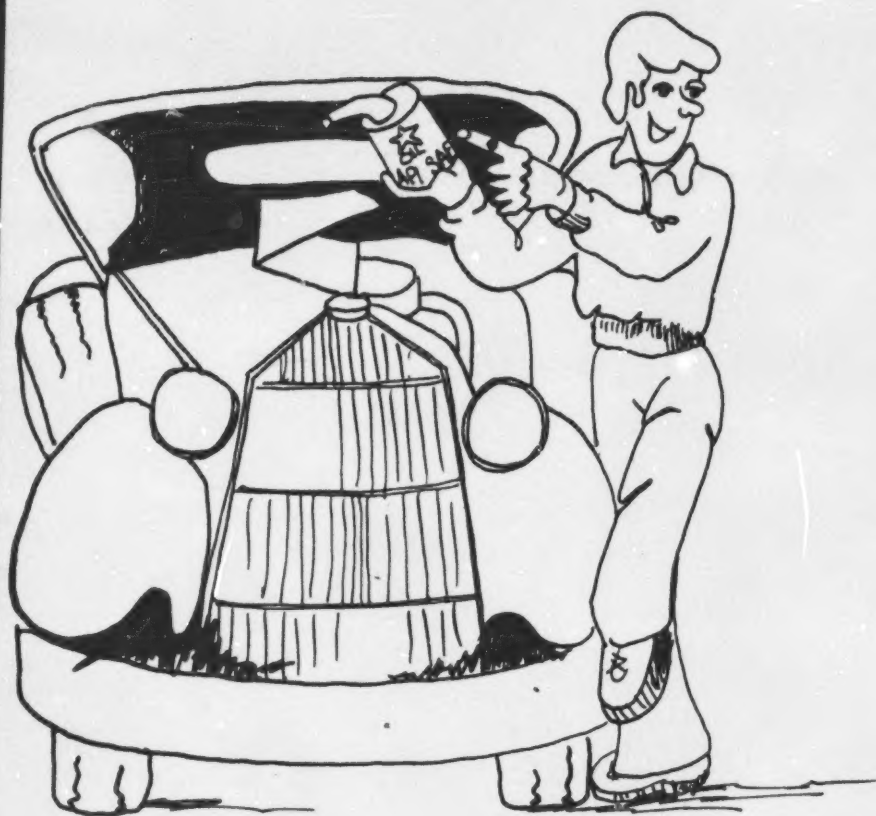
Don't carry unnecessary weight.

III. Maintenance and Car Care: Fuel Saving Tip No. 7



**Change oil and oil filter
at recommended intervals.**

III. Maintenance and Car Care: Fuel Saving Tip No. 8

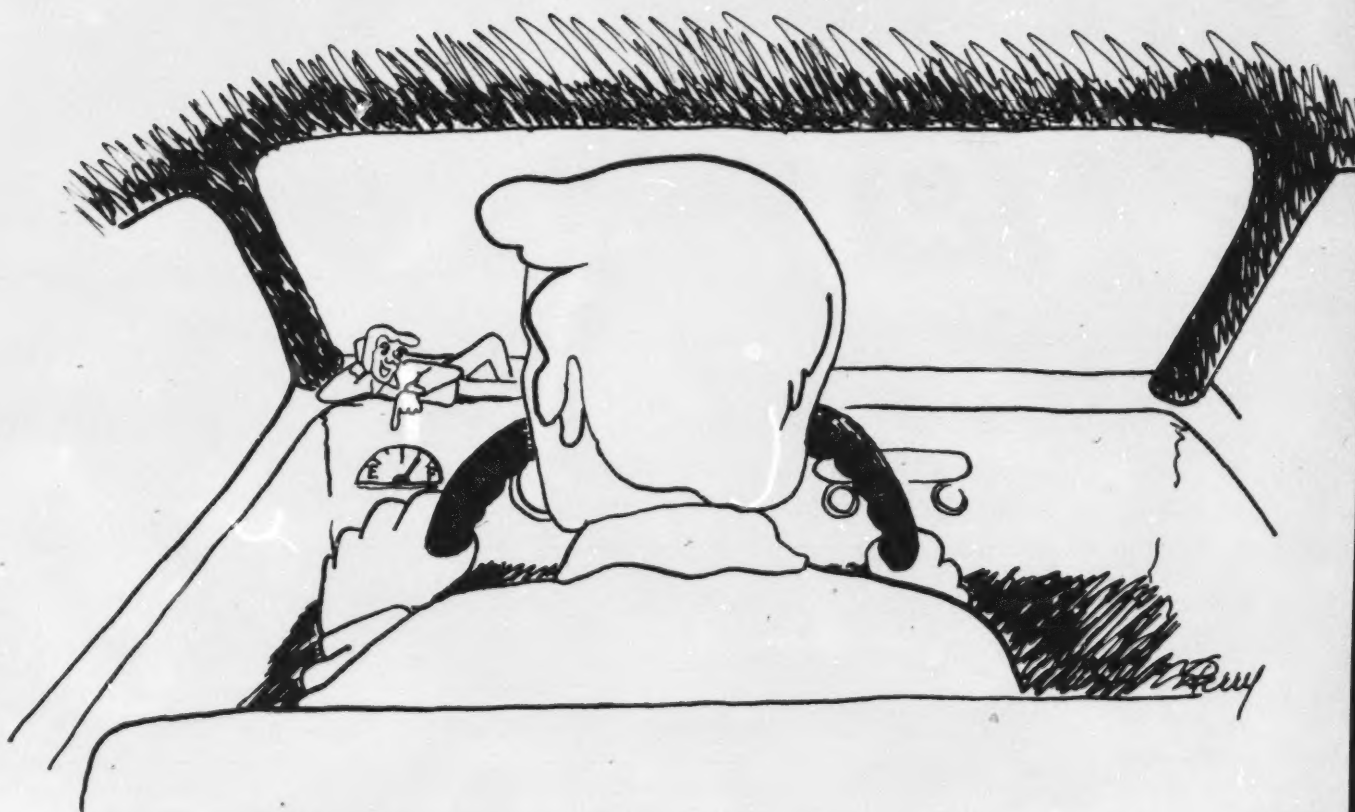


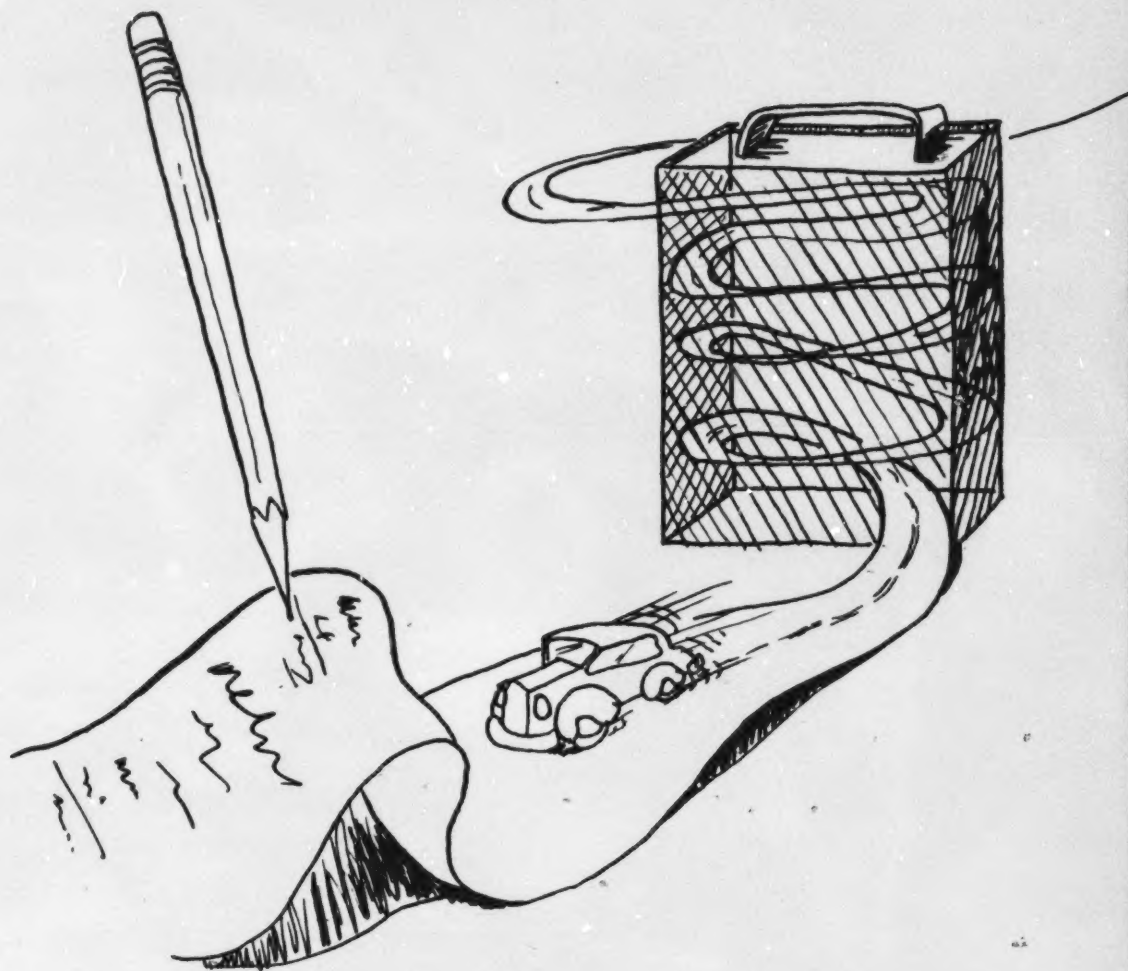
**Use a good quality multi-grade
(multi-viscosity) oil having an
API SAE rating on the container.**

III. Maintenance and Car Care; Fuel Saving Tip No. 9

FUEL SAVING TIPS: SECTION IV

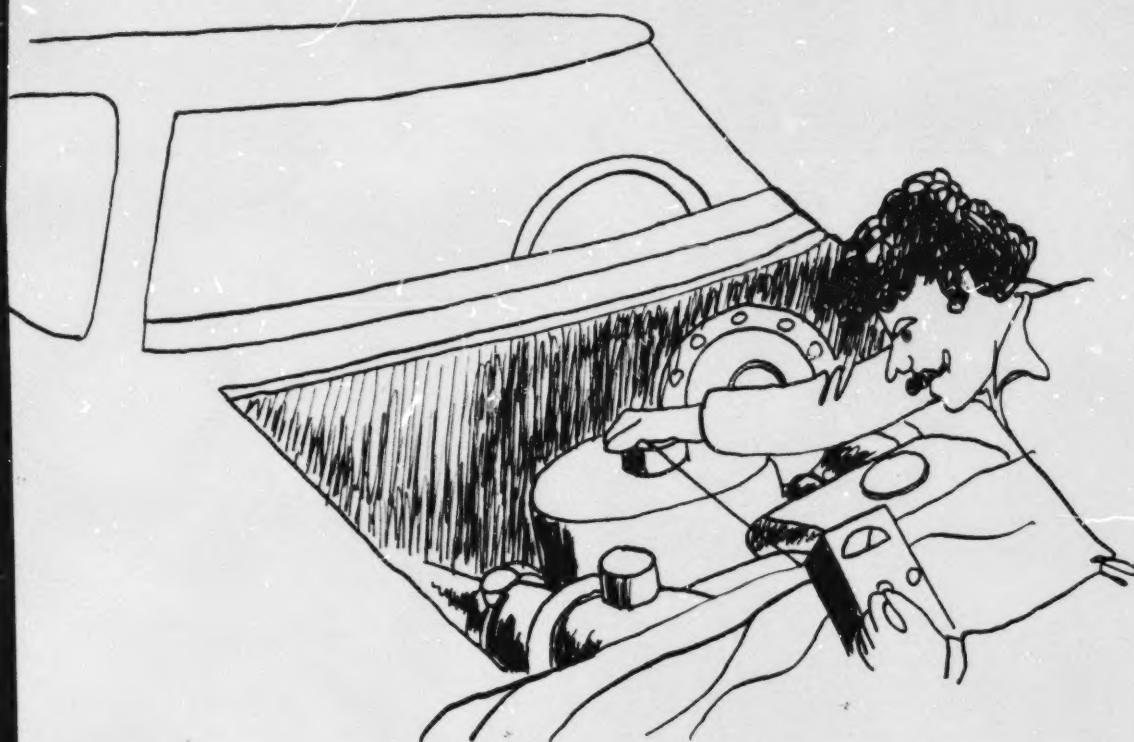
Become Aware of Gas Usage





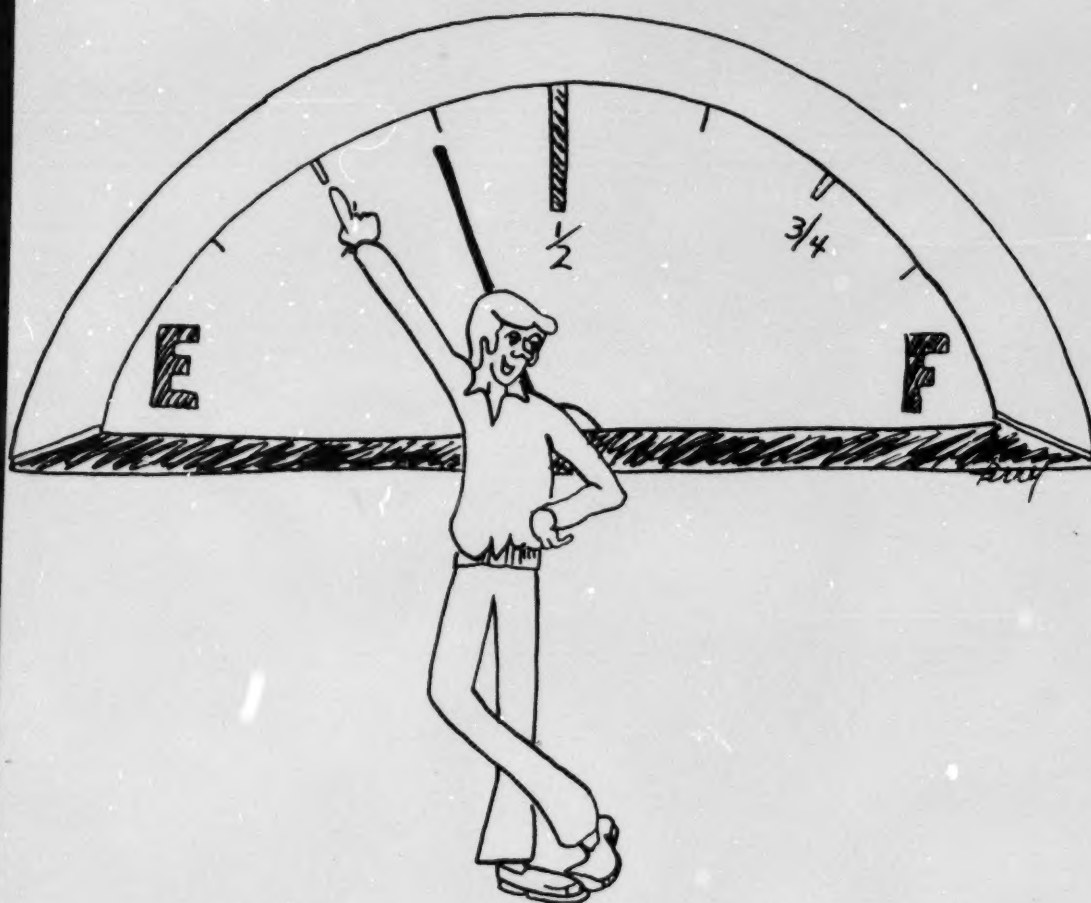
Keep a check on miles per gallon.

IV. Become Aware of Gas Usage: Fuel Saving Tip No. 1



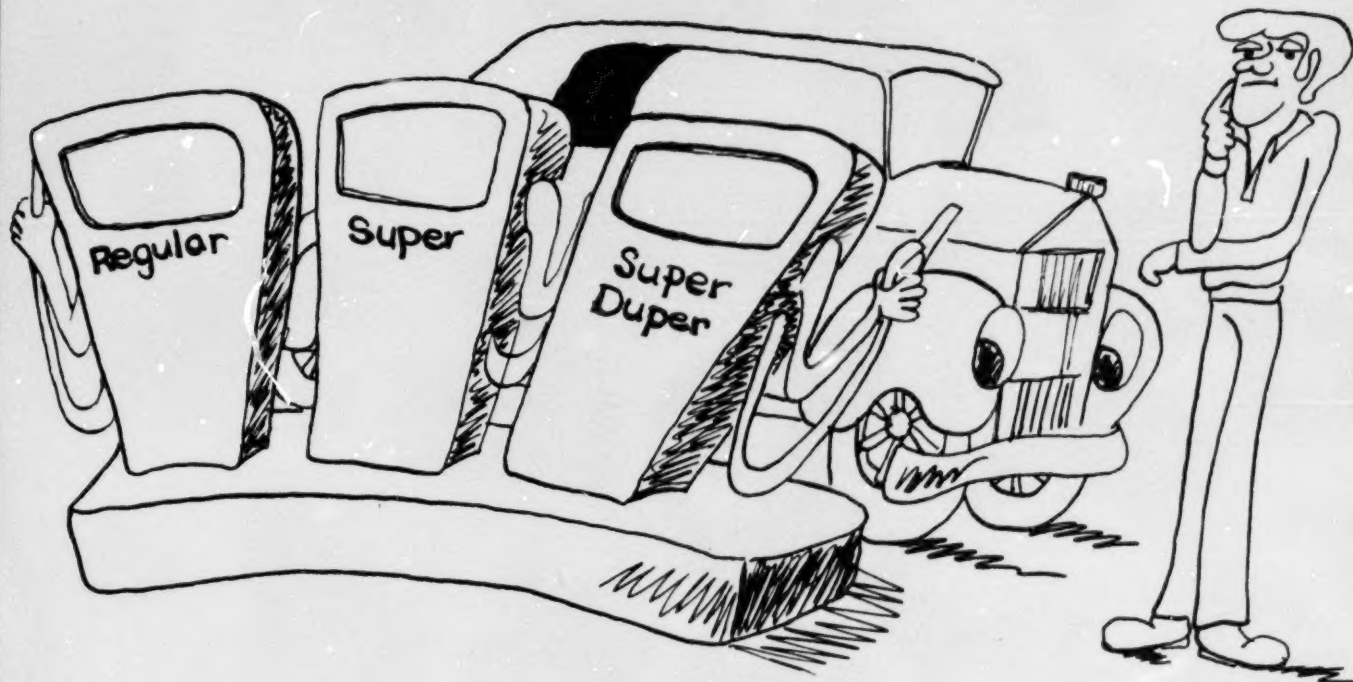
Consider installing a miles-per-gallon meter or a manifold vacuum guage.

IV. Become Aware of Gas Usage: Fuel Saving Tip No. 2



Buy gas only when the guage shows a quarter tank or less.

IV. Become Aware of Gas Usage: Fuel Saving Tip No. 3



**Use gasoline of the proper
octane rating.**

IV. Become Aware of Gas Usage: Fuel Saving Tip No. 4

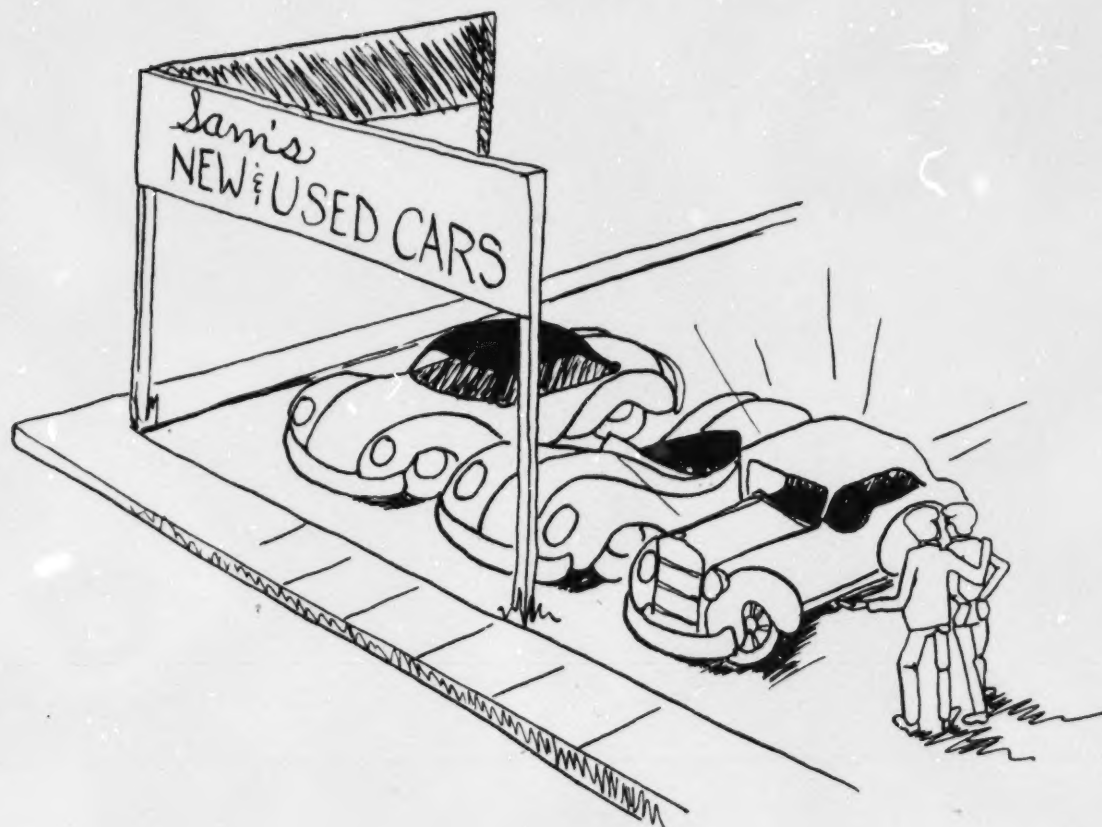


Don't let the gas station attendant overfill your tank.

IV. Become Aware of Gas Usage: Fuel Saving Tip No. 5

FUEL SAVING TIPS: SECTION V

New Car Selection





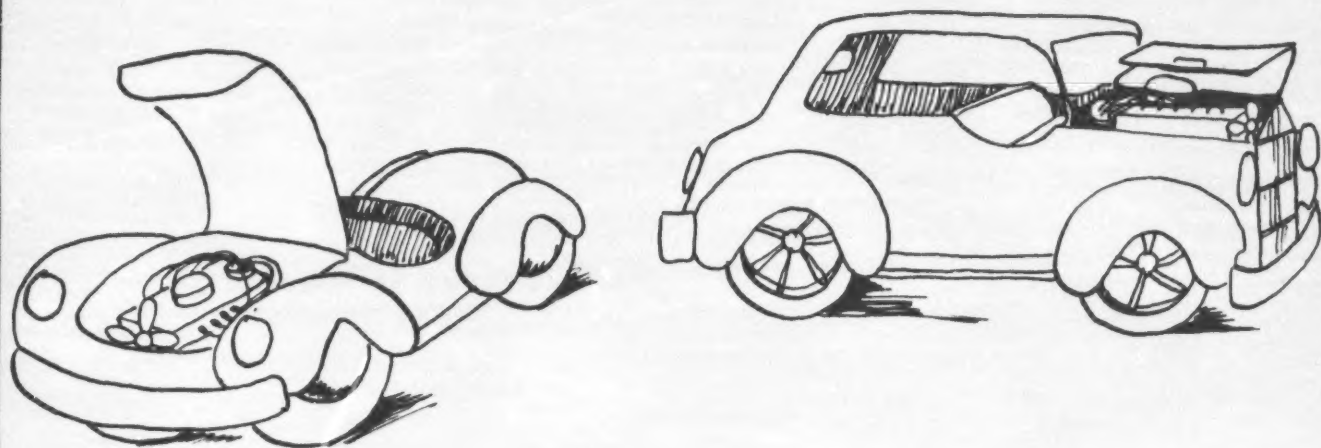
**Study EPA/DOE gas mileage
charts before buying a car.**

V. New Car Selection: Fuel Saving Tip No. 1



Consider vehicle weight.

V. New Car Selection: Fuel Saving Tip No. 2



**Four-cylinder engines consume
less fuel than six or eight-
cylinder engines.**

V. New Car Selection: Fuel Saving Tip No. 3



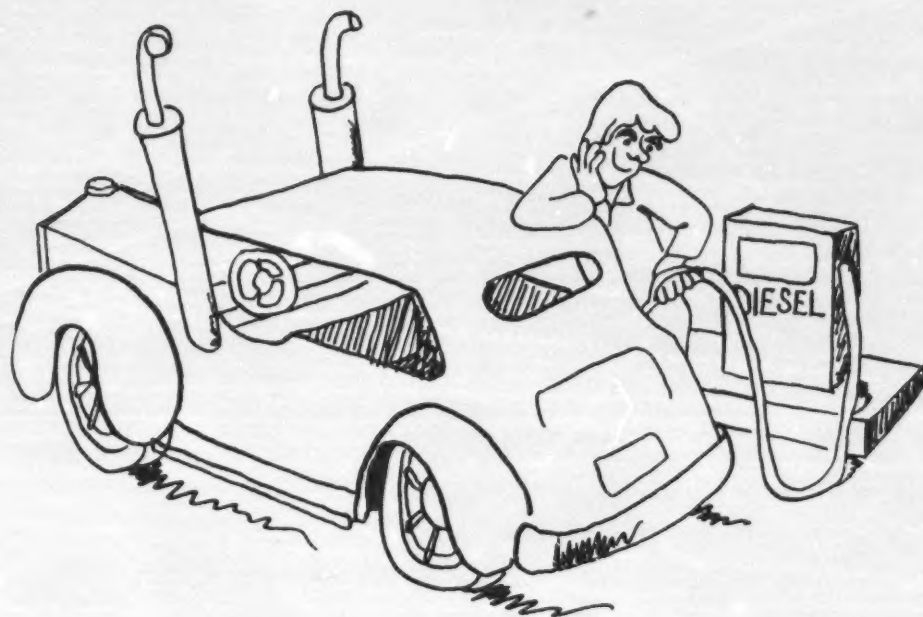
Consider fuel use in air conditioning.

V. New Car Selection: Fuel Saving Tip No. 4



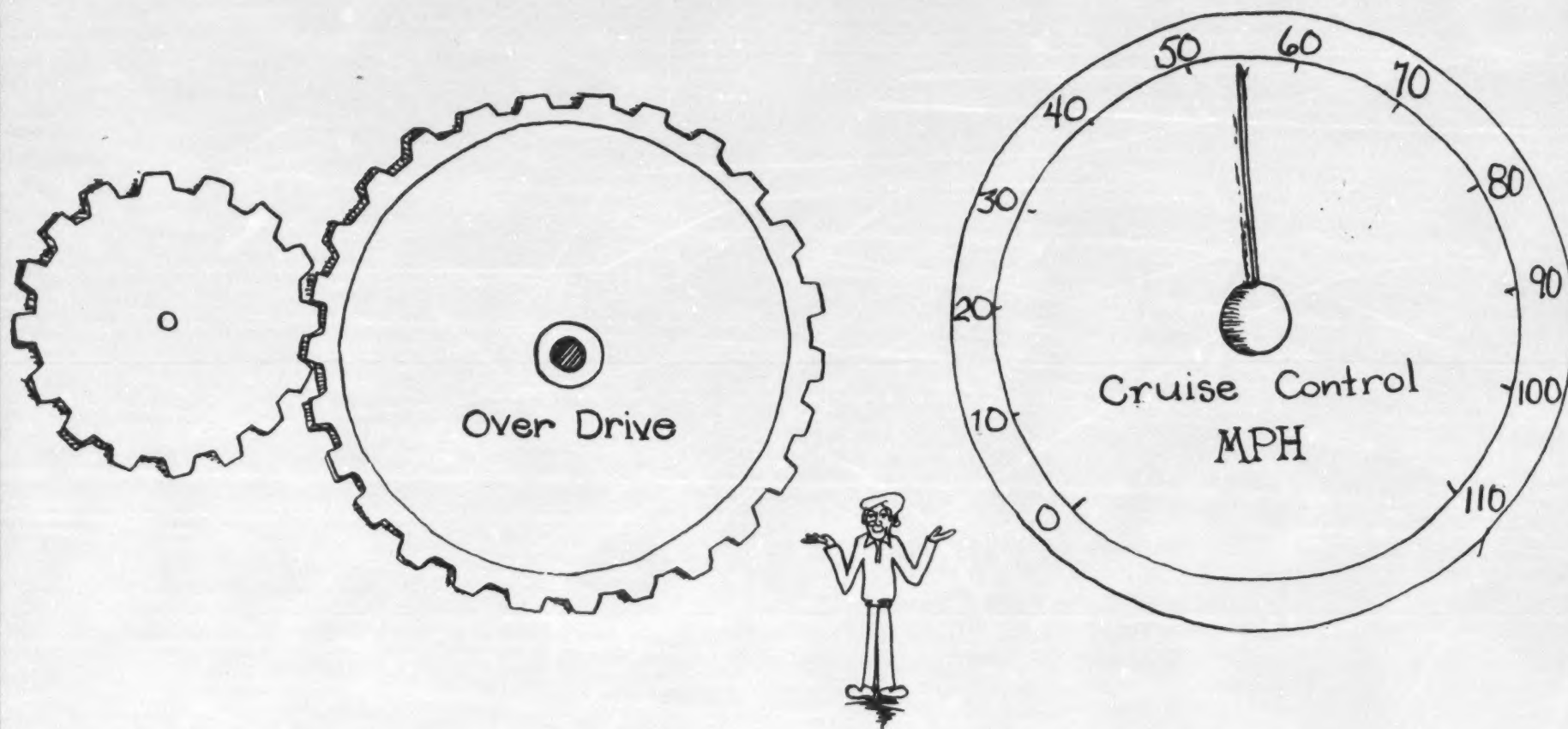
Convenience accessories such as automatic transmission and power steering add to fuel consumption.

V. New Car Selection: Fuel Saving Tip No. 5



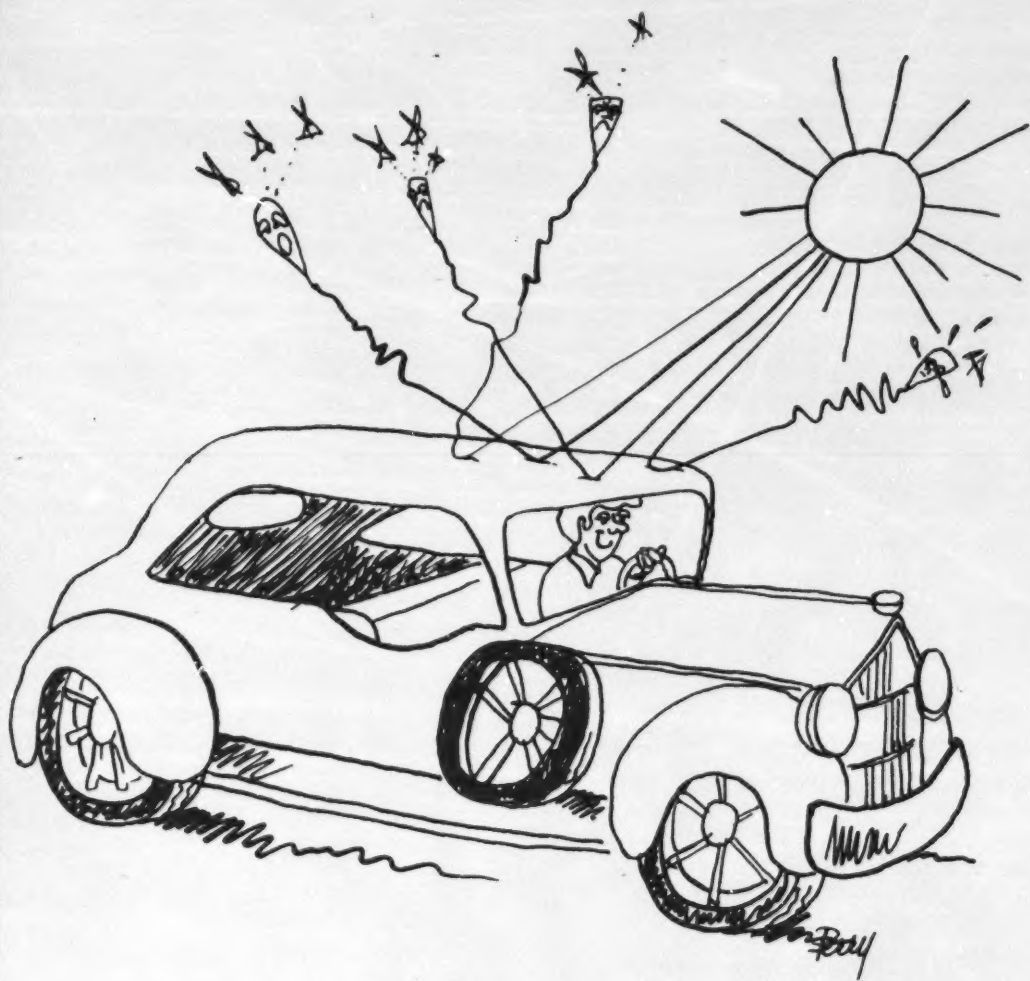
Diesel engines are more fuel efficient.

V. New Car Selection: Fuel Saving Tip No. 6



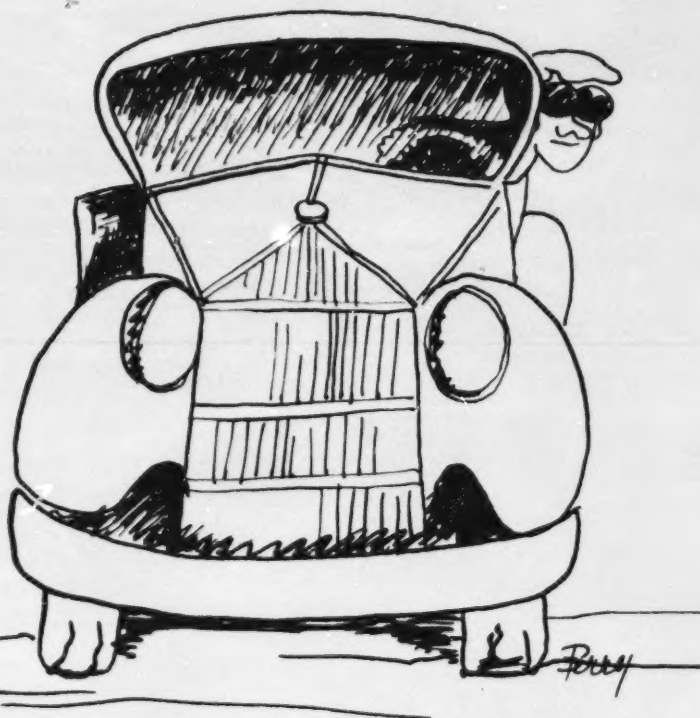
**Overdrive options and cruise control
can save on fuel.**

V. New Car Selection: Fuel Saving Tip No. 7



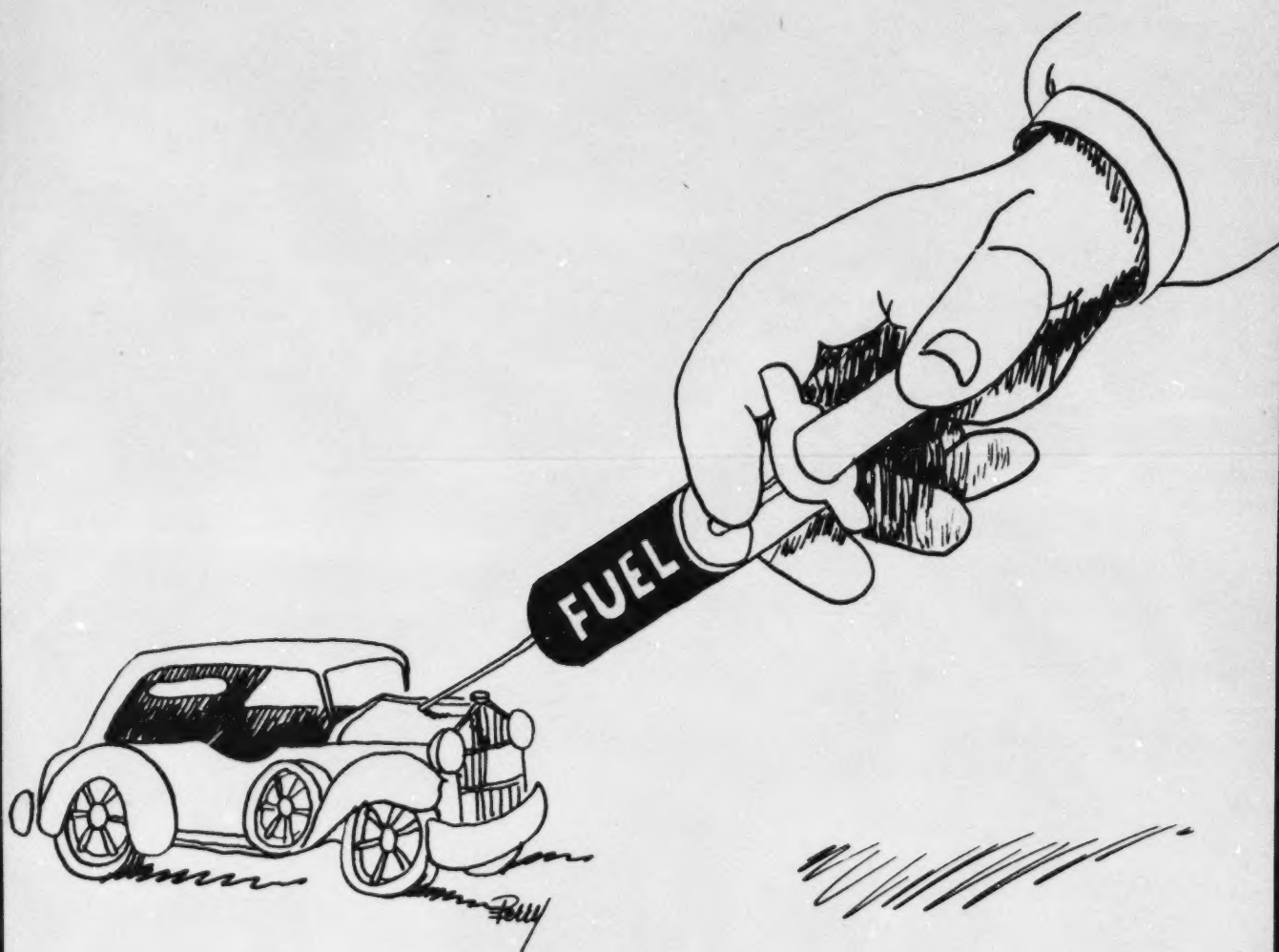
**Light colors reduce
heat absorption.**

V. New Car Selection: Fuel Saving Tip No. 8



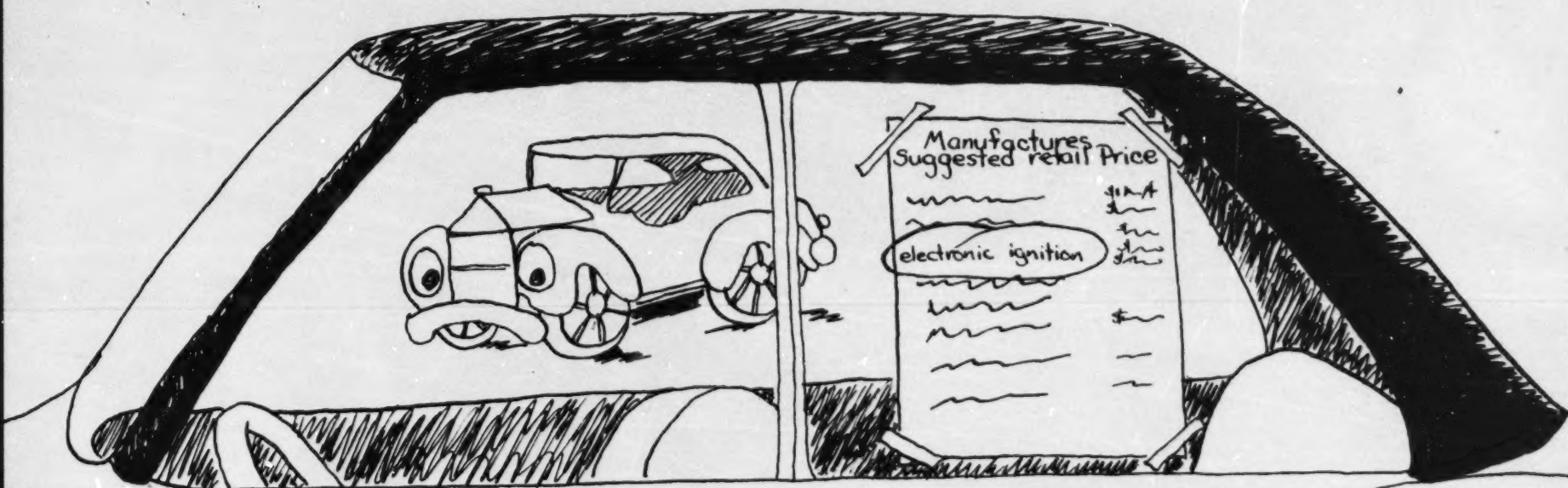
**Use tinted glass to reduce
need for air conditioning.**

V. New Car Selection: Fuel Saving Tip No. 9

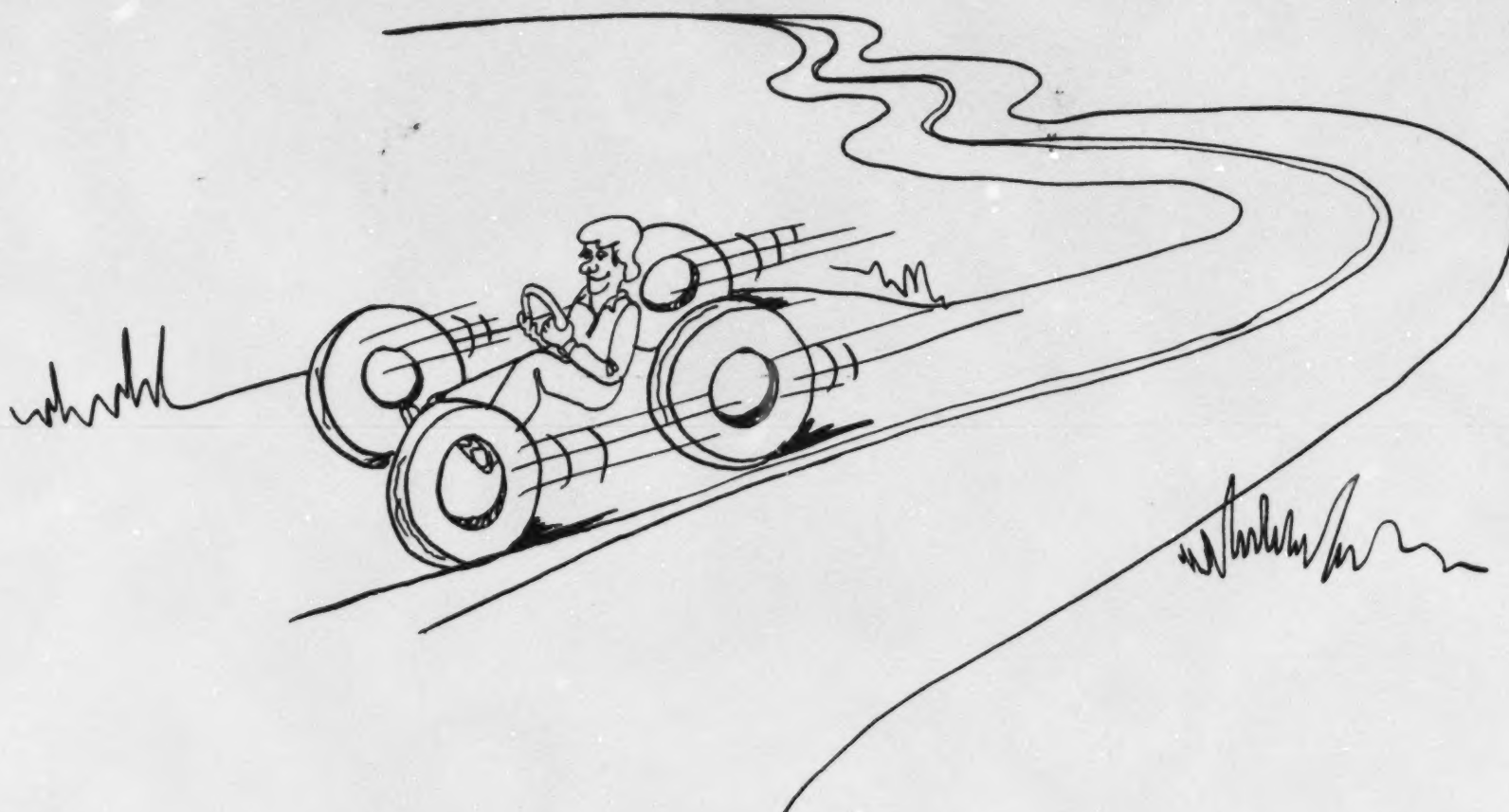


Fuel injection usually saves fuel.

V. New Car Selection: Fuel Saving Tip No. 10



**An electronic ignition system
is a fuel saver.**



**Radial ply tires allow
better gas mileage.**

V. New Car Selection: Fuel Saving Tip No. 12